BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 47] 1950 [No. 8

A REVIEW OF HYPERENDEMIC MALARIA

by

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Introductory

The malaria found in the most endemic regions of the tropical zone differs characteristically from that which occurs in the most endemic areas of more temperate zones. In the temperate and subtropical zones malaria is a seasonal disease, liable to occur in severe epidemics, that often have a heavy mortality and always cause interference with individual and communal activity. This interference may be great enough to disrupt communications and even civilizations. In the tropical zone, where transmission is both more constant and more intense, malaria carries an even greater hazard to immigrant groups and individuals ; but at the same time it may show such slight manifestations

among the indigenous adults that at first glance malaria might appear to be absent. CHRISTOPHERS (1924) gave the classical description of this latter phenomenon under the name of " hyperendemic malaria ". The same author (1949) describes this as a condition of the most perfect balance of infection and immunity, almost amounting to commensalism, and occurring in certain aboriginal races. Unfortunately the term hyperendemic has since been applied to conditions in which the balance is less effective, since it has been made to include any communities in which the spleen rate is over 50 per cent., as was in fact done by the Malaria Committee of the League of Nations (1940), of which Christophers was a member. In other words two entirely dissimilar types of malaria are being included in one group. BOYD (1949) also uses the term hyperendemic in Christophers's original sense, in particular correlating the development of hyperendemicity with an intensity of anopheline infestation that may lead to the chance of infection almost every night.

In this review we shall bring together, from various parts of the world, some of the records that are sufficiently complete for our purpose, and in the light of these results attempt to define the true nature of hyperendemicity and the conditions essential to its occurrence. Our other objective concerns the question of malaria control : if hyperendemic malaria is unaccompanied by any inefficiency, suffering or mortality, as suggested by the definition of Christophers, to what extent is control necessary or desirable ? If on the other hand the evidence in favour of commensalism is inadequate, what additional data are required ? Finally, as wide-scale control of rural malaria under tropical conditions has now become potentially practicable, what would be the effect on people normally living under hyperendemic conditions of either reducing or eliminating malaria transmission ?

Any answer to the foregoing questions hinges on immunity, since this is the outstanding feature of hyperendemic malaria. Ideas about the nature of immunity to malaria have been somewhat varied. That some protection was conferred by residence in malarious areas was recognized from earliest times, while CHRISTOPHERS (1924) in India, and SCHÜFFNER (1919) in Indonesia were among the first to define the nature of immunity on an epidemiological basis. SERGENT (1924) used the term " premunition ", and defined this as an immunity dependent upon the persistence of the infecting organism in the immune host ; but it was not until much later that TALIAFERRO (1941), TALIAFERRO and MULLIGAN (1937), and others provided the histo-pathological background. The League of Nations Malaria Commission (1940) made a valuable attempt to define the different types of immunity in terms of parasite strain and in congenital, residual and other groups. Whatever the exact mechanism of immunity may be, the significance of hyperendemicity lies in its development of immunity.

Definitions

Spleen Rate.—The percentage of people in whom the spleen is palpable on examination. It should be noted that the usual restriction of the spleen rate to the results of examinations of children is not here observed.

Parasite Rate.—The percentage of people in whom examination of a single thick blood film reveals the presence of parasites.

Parasite Infestation.—The average number of parasites present per cubic millimetre of blood of those found positive for parasites. Although the arithmetic mean, as given by most authors, is used in this paper, the geometric mean is a much more satisfactory mode of recording this index.

Acute Infestation (Christophers).—The early stage of the infection as observed in hyperendemic areas among children, and accompanied by high parasitaemia and observable illness.

Immune Infestation (Christophers).—The stage observed in older children and adults living under hyperendemic conditions, when parasitaemia is low and illness is apparently absent.

Examples of Hyperendemicity and High Endemicity

The criteria of hyperendemicity in malaria are parasite rates and infestation, spleen rates and average enlargement, infective anopheline density. It is, however, the effect of the infection on the population, that is to say the degree of morbidity and mortality, which matters to the community. As in the similar case of amoebiasis, while the number of carriers of *Entamoeba histolytica* is of hygienic significance, it is the number of cases of dysentery or liver abscess that affects the welfare of the people. In order to appraise damage done by the infection, the following observations are of value : mortality directly attributable to malaria, reliable malaria sickness rates, presence or absence of fever and anaemia, and any estimates that throw light on the state of physique. Only rarely are these observations made with any degree of completeness, but examples from various hyperendemic areas of the tropics are given below. Many other studies have had to be excluded on account of the inadequacy of comparable data given in them. The examples quoted refer, so far as blood examinations are concerned, to thick films.

Group A. Fully Developed Hyperendemicity

1. Christophers 1924. Singhbhum, India

These observations were made on a mixed group of 370 aboriginal and Aryan people, some of the latter being recent arrivals in the area. Although anopheline infestation was high in this area, no catches were recorded. It was concluded that there was no evidence of notable child mortality nor of adult illness during the dry season, the period of examination. The haemoglobin percentages were if anything a little lower in the less infected groups than in the more heavily infected.

Table I.

Age Group	0–2	3–5	6–10	11–16	Adult
Spleen Rates	88	92	74	63	11
Parasite Rates	100	96	90	75	49
Examined	33	47	98	25	159

P. falciparum was almost universal among those examined. Crescents were present in 22 per cent. of children, and 4 per cent. of adults. The very high parasite infestation in infants dropped to one-ninetieth of this figure in adult life : the actual figures recorded are given later in this paper (Table XIX).

2. Farinaud and Prost 1939. Haut Chlong, Indo-China

These authors examined some 2,200 children and adults of the indigenous Moïs. No mosquito records are given. There is a high infant mortality of 300 per 1,000, of which 13 per cent. is in the first month. (It seems therefore unlikely that much of this latter figure is attributable to malaria.) It is only between the ages of eight to ten years that children have real control of their infections.

Table II.

Age Group	0–6 Mos.	7–12 Mos.	1–5	6–10	11–15	Adult
Spleen Rates	73	93	97	84	63	19
Parasite Rates ...	72	97	95	76	60	27

P. falciparum was the only species present in adults, and provided 50 to 80 per cent. of the parasites seen in children. In children aged one to two years crescents were present in 42 per cent., but in only 5 per cent. of adults.

3. MACKERRAS and ABERDEEN 1946. Wewak, New Guinea

Some 370 Hwain adults and children were examined, in an indigenous community of about 1,000. Vector *Anopheles* were abundant. As the species concerned (*A. punctulatus*) does not rest in houses by day, night catches were made, and two collectors caught 483 in a night. Among this number there was a sporozoite rate of 2 per cent., and the authors estimate that the chance of infection was 150 to 200 per annum, well distributed over the year.

Evidence concerning mortality could not be collected, but the children appeared to be quite unperturbed by their heavy infections.

TABLE III.

Age Group	0–1	2–12	Adult
Spleen Rates	93	92	58
Parasite Rates	92	71	32
Examined	73	200	100

P. falciparum accounted for 54 per cent. of all infections : although *P. vivax* was common in infants it was rare in adults. Whereas the gametocyte rate among infants was 49 per cent., it was only 5 per cent. in adults. There was a rapid fall in parasite infestation with age.

4. BARBER and OLINGER 1931. Lagos, Nigeria

These authors studied the epidemiology of malaria in various places in Southern Nigeria ; the results quoted appear to refer to examinations of over 6,000 adults and children in the neighbourhood of Lagos. They found an average of five female vector mosquitoes per room, having an annual average infectivity of about 6 per cent. This gives, by the formula of TURNER and WALTON (1946), which is used throughout this paper, an annual frequency of infection of 30 to 40, with some infection occurring throughout the year.

There was a general absence of symptoms among those studied, and no correlation could be found between fever and parasite prevalence.

TABLE IV.

Age Group	0–1	1–4	5–8	9–12	13–15	Over 15
Parasite Rates	29	94	94	87	76	49
*Heavy Infections per cent. ...	62	75	58	32	23	9
Examined	1,664	424	1,104	919	636	2,139

*One or more parasites per field.

There was a parasite rate of 98 per cent. during the third year. *P. falciparum* was the first infection and was nearly universal, *P. malariae* was found in 30 per cent. of children. Crescents were present in 34 per cent. during the first year of life but in only 3 per cent. of adults, and there was no seasonal variation in the crescent rate. There was a rapid diminution of parasite infestation after the second year of life : detailed figures of infestation are given later (Table XIX).

5. McCarthy 1941. Pemba, East Africa

The figures quoted are taken from this author's comprehensive study of the islands of Zanzibar and Pemba ; they refer to the area in which there is the least interference by mosquito control and racial admixture, and are based on some 2,000 examinations of Bantu people.

There was an average during the year of over four female vectors per house, having a mean sporozoite rate of about 3 per cent. This gives an infective density of 0·15 per house, and an annual chance of infection of about 16, or 30 if allowance be made for the hand catching methods used. There was a seasonal variation in the infective density from 0·2 to 0·02 per house.

Babies at the end of the first year were obviously sick, but improvement generally set in at the end of the second year and immunity appeared to be at a maximum between the ages of 10 and 30 years. McCarthy comments on the individual variation in the reaction to infection among both children and adults. But in the latter there was only an occasional day's pyrexia.

Table V.

Age Group ...	0–1	1–5	6–10	11–15	16–20	Adult
Spleen Rates ...	56	87	68	48	15	6
Parasite Rates ...	40	74	63	51	24	11
Examined ...	20	266	1,751	619	286	189

Over 90 per cent. of parasites were *P. falciparum*, rather fewer in young children, when there were present about 11 per cent. each of *P. vivax* and *P. malariae*. The crescent rate varied seasonally, in children aged one to five from 4 to 43 per cent., and in the remainder from 2 to 7 per cent. Parasite infestation figures showed a great drop after the age of one year, but remained fairly high until after the age of five, after which they steadily fell to an adult level that was one thirty-fifth of the infant infestation. (See Table XIX.) There was a considerable seasonal variation in these parasite infestation figures up to the age of ten years, after which the variation was slight.

6. Wilson 1936. Gombero, Tanganyika

These results are based on repeated examinations of 440 Bantu people over a period of 17 months. The years covered were dry ones, and the average house infestation (hand catches) was over four per house of female vector *Anopheles* (*gambiae* and *funestus*) ; this, with a sporozoite rate of 12 per cent., gave a mean infective density of 0·55. This gives an annual chance of infection of about 60. Transmission never ceased though there was a variation in the infective density from 3·58 to 0·02 per house.

Complaint of fever was confined to the first five years of life, and during the first four years there was a low haemoglobin level as compared with other age groups, with a reticulocytosis having a peak of 130 per thousand erythrocytes during the second year. Infant mortality, so far as it could be assessed on such small numbers, was 125 per thousand live births. The deaths per thousand births in the lifetime of the mother were 427, which may be compared with the corresponding figure of 501 in South Africa in places where the malaria risk is absent. Infants were evidently ill on first infection and at irregular intervals during the following six months, and during the following two or three years occasional attacks of fever occurred. In all these manifestations of malaria, considerable individual variation was noted. No apparent illness attributable to malaria could be detected in adults, and the health of adolescents and young people seemed to be good unless they encountered presumably alien strains of parasites in the course of travel, when slight and brief attacks occurred.

TABLE VI.

Age Group	0–1	1–5	6–10	11–15	16–20	Adult
Spleen Rates	89	93	77	44*		39
Parasite Rates	88	99	80	60	54	45
Examined	120	434	398	184	256	1,634

*This figure refers to the age-group 11–20.

The parasite species were present in the proportions of *P. falciparum* 39, *P. malariae* 11, and *P. vivax* 4, the two latter species being present mainly in children. While there were 35 per cent. of gametocyte carriers in the age group 1–5 years, there were only 3 per cent. in adults. The parasite infestation of nearly 8,000 during the first year, fell rapidly during the third, fourth and fifth years to reach one-fortieth of the infant level in adult life. Although there was some seasonal variation in these figures, this variation was almost wholly confined to the first year of life.

7. GARNHAM, 1929, 1938, 1939, 1949. Kisumu, Kenya

Numerous surveys have been made of the Nilotic inhabitants of the country around the Kavirondo Gulf of Lake Victoria. Transmission of the disease occurs throughout the year, but figures of anopheline density vary according to locality. Day catches by HADDOW (1942) in huts near the Lake shore over a period of one year gave a daily mean of 41 female *Anopheles gambiae* and *A. funestus* ; in the Kano Plains, Garnham obtained a figure of 40 over a period of nearly two years. Mosquito infectivity was between 3 and 4 per cent., which suggests that in a hut containing five people each occupant is likely to receive over 100 infective bites a year. Elsewhere in Kavirondo the average daily number of female vectors may be considerably lower, for example 4, and the number of infective bites will then be about 15 a year.

Malaria appears to cause few symptoms in the indigenous inhabitants, and only 10 per cent. of the cases in children could be classified as severe. Infant mortality is probably about 300 per thousand live births. Fever was slight, for 39 per cent. of an unselected group showed pyrexia not higher than 100°F., and new infections in infants were accompanied by little interruption of their growth. The total red cell count dropped by only 13 per cent. Direct mortality from the disease was low. The mildness of the disease in these children may have been partly the result of the very small quantities of quinine they were given, this being at most 30 grains during the year.

TABLE VII.

Age Group	0–6 Mos.	6 Mos.–3	4–9	10–15	Adult
Spleen Rates	15	68	60	12	11
Parasite Rates	54	93	77	58	36
Parasite Intensity (Number in 50 fields)	48	18	9		Less than 1

The species of parasite was predominantly *P. falciparum* : up to 90 per cent. in the second age group and 36 per cent. in adults ; while *P. malariae* was found in 49 and 4 per cent. respectively. The crescent rate in young children was 33 per cent., in adults only 2 per cent. By the age of nine or ten months nearly all had contracted malaria. Parasite infestation, as shown in Table XIX, dropped greatly with age.

8. SCHWETZ *et al.* 1934, 1929. Stanleyville, Belgian Congo

These records are based on examinations of 290 Africans living near Stanleyville on the Congo River, made in 1933, and earlier anopheline studies made in the same locality.

The average sporozoite rate in *Anopheles gambiae*, the species that provided two-thirds of the house-haunting vectors, over the wetter months of the year, was 12 per cent. ; in the other vector species, *A. nili*, *A. moucheti* and *A. funestus*, it was 4–5 per cent. The authors remark that there is little seasonal variation.

In spite of the apparent good health of the infants, their blood shows many of the abnormalities associated with anaemia. The spleen rates are stated to be approximately equal to the parasite rates, although the former are not given in detail. Nearly all children are infected by the age of six months, and the diminution of parasitization which follows reaches its lowest level at the age of 15 years, after which the children may be counted as adults from the point of view of malaria.

TABLE VIII.

Age Group ...	0–2	3–5	6–10	11–15	16–20	Adult
Parasite Rates ...	85	96	89	92	71	54
Examined ...	27	24	55	39	35	109

The parasite species were present in the following proportions : *P. falciparum* 21, *P. malariae* 5 and an occasional *P. vivax*. The crescent rate ranged from 20 to 25 per cent. in the younger children to 12 per cent. in adults.

9. SCHÜFFNER, SWELLENGREBEL, ANNECKE and DE MEILLON, 1932. East Transvaal and North Natal

These results from the most malarious regions of the Union of South Africa represent the summation of a series of surveys of places in which malaria was not markedly seasonal except in the case of immigrants. Whereas 30 per cent. of working days were lost by immigrant Africans from areas of low endemicity, only 4 per cent. of days were lost among the rest of the African working population. In the areas of highest endemicity, 147 women had borne 576 children, of whom 39 per cent. had died at various ages, compared with 28 per cent. in areas of low endemicity.

The average daily catches were four *Anopheles gambiae* and *A. funestus* per house in the transmission season. Among these the sporozoite rate was 5 per cent. in *A. gambiae* and 7 in *A. funestus*.

TABLE IX.

Age Group ...	0–1	2–5	6–10	11–15	16–25	Over 25
Spleen Rates ...	63	92	87	74	52	46
Parasite Rates ...	60	91	76	64	51	34
Examined ...	73	146	283	283	322	600

In children the proportions of species were : *P. falciparum* 66, *P. vivax* 12, *P. malariae* 3 ; and in adults 33, 4 and 0·5 respectively. The percentage of heavy infections (one parasite to ten or less leucocytes) fell from 55 in the age group 2–5, to 4 among adults. The crescent rate was 17 per cent. in children, and no more than 3 per cent. in adults.

10. SWELLENGREBEL 1949. Gansè, Dutch Guiana ; SWELLENGREBEL & VAN DER KUYP 1940. Surinam

In this village on the upper Surinam River, over 800 Negroes were examined. The malaria was slightly seasonal among immigrants, and people suffering from fever were treated with quinine. The infant mortality was 113 per thousand over the years 1927–39.

Daily catches in one house gave an average of six *Anopheles darlingi* per catch.

TABLE X.

Age Group ...	0–1	2–5	6–10	11–15	16–25	Over 25
Spleen Rates ...	90	90	78	53	18	15
Parasite Rates ...	79	98	96	74	50	26
Examined ...	71	140	186	129	60	221

P. falciparum was present in 76 per cent. of children and 28 per cent. of adults, *P. malariae* in 15 and 2, and *P. vivax* in 14 and 4 per cent., respectively. The crescent rate in children was 1·5 per cent., nil in adults. The percentage of heavy infections was 81 in the age group 2–5, but only 2 in adults.

GROUP B. HIGH ENDEMICITY WITH INCOMPLETE IMMUNITY

The foregoing examples are all of communities in which there is, in our opinion, a fully developed state of tolerance or immunity among adults : communities, in fact, in which the hyperendemic state is present without doubt. There is another group of highly endemic localities, which are commonly classed as hyperendemic, but which have many distinguishing features and are clearly separable from the first, and for which, in our opinion, the term hyperendemic should not be used. Examples of these are given below, and they range from the high endemicities found in the East Indies, and even in tropical Africa, to the comparatively low rate of transmission recorded in the Caribbean in the comprehensive study of EARLE (1939). This lower range of endemicities is characteristic of the majority of findings in the Neotropical Region, and in continental India.

1. SCHÜFFNER, SWELLENGREBEL, ANNECKE and DE MEILLON 1932, SCHÜFFNER 1938. Mandailing, Sumatra

In this study 3,260 people of all ages were examined. Although the results evidently do not allow this group to be included within the most hyperendemic classification, a considerable degree of immunity was found.

The general mortality was 45 per thousand. Of the children born, 58 per cent. reach the end of the second year of life.

The average daily catch of *Anopheles sundaicus* was roughly estimated at five per house ; among them there was found a sporozoite rate of 0·4 per cent. Other anopheline species played a minor part in transmission.

TABLE XI.

Age Group ...	0–1	2–5	6–10	11–15	16–25	Over 25
Spleen Rates ...	87	93	92	94	92	90
Parasite Rates ...	41	50	33	24	10	8
Examined ...	343	693	579	268	235	1,148

The proportions of species present in children were : *P. falciparum* 26, *P. malariae* 11 and *P. vivax* 6, while in adults these were 6, 1 and 0·6 respectively. The crescent rate in children was 8, and in adults 0·8 per cent. Hardly any seasonal change in malaria was found.

2. SWELLENGREBEL 1949. Western Sentani Lake, New Guinea

While reviewing the results of surveys in various places in Western New Guinea, in the light of other findings, the authors record the following examinations of some 900 people.

House catches gave an average of roughly three vectors per house, although the species concerned, *A. punctulatus punctulatus* and *A. p. farauti*, are not truly house-haunters. The sporozoite rates were 0·6 and 1·8 per cent. respectively. Malaria was slightly seasonal only in immigrants. During 1946–48 there was a total annual malarial morbidity of 29 per cent.

TABLE XII.

Age Group ...	0–1	2–5	6–10	11–15	16–25	Over 25
Spleen Rates ...	93	99	97	94	72	69
Parasite Rates ...	76	93	69	38	33	29
Examined ...	58	89	350	173	82	161

Parasite species were present as follows: in the children examined *P. falciparum* 49, *P. vivax* 17, *P. malariae* 11 per cent., and in adults 24, 6, and 2 per cent., respectively. The percentage of heavy infections (one parasite to ten or less leucocytes) fell from 40 in the youngest age group to nil in adults. The crescent rate was 3 per cent. in children and nil among adults.

3. BALFOUR 1935. Nea Carvali, Greece

During his extensive studies in Greece, Balfour recorded the following examinations of 330 people at Nea Carvali. In the neighbourhood 118 *Anopheles* were caught in one catching station per week (it is not possible to ascertain from the paper how many searches this represented). The sporozoite rate in *A. sacharovi* was 1·3 per cent., and in *A. superpictus* 0·8. People of all ages were periodically incapacitated by attacks of malaria.

TABLE XIII.

Age Group	0–1	1–4	5–9	10–14	Over 25
Spleen Rates	25	79	100	100	93
Parasite Rates ...	56	64	40*		57
Examined	12	42	30	79	165

*May have been affected by quinine administration; this figure refers to the age-group 5–14.

Parasite species were present in the following proportions: *P. falciparum* 38, *P. vivax* 35, *P. malariae* 27.

4. WILSON 1947. Diego Suarez, Madagascar

The records here given refer to two sets of examinations of some 340 mixed Bantu and indigenous people (of uncertain racial origin), and to mosquito records covering a period of 15 months, in the country around Diego Suarez.

An average of about eight female vectors per house was caught by spray-catching in uncontrolled areas; of these 50 to 70 per cent. were *A. funestus*, the remainder being *A. gambiae*. The infectivity was about 2·5 per cent. in the former and 5 per cent. in the latter, giving a probability of infection of about 25 times a year.

The usual greater degree of illness among infants was noted, but definite attack conditions were also present in a certain number of older children and even adults, of the indigenous people.

TABLE XIV.

Age Group	1–5	6–10	11–20	Adult
Spleen Rates	80	83	75	47
Parasite Rates	81	93	68	26
Examined	65	79	91	103

The parasite species present were *P. falciparum* 77, *P. malariae* 17 and *P. vivax* five. The crescent rate varied seasonally from 16 to 3 per cent. Whereas the parasite infestation was about 3,500 in the youngest age group given, it fell to 900 in the 11 to 20 age group, and 300 in adults.

5. WILSON 1939. Iramba, Tanganyika

The Nyiramba tribe live on a plateau of 4,000 feet altitude in central Tanganyika, and suffer from seasonal malaria. For several months of the year there are no *Anopheles* to be found, and numbers are not large even during the period of transmission. The chance of infection is certainly not more than two to four times a year. Adults as well as children suffer from attacks of malaria during the season.

TABLE XV.

Age Group	0–1	1–5	6–10	11–20	Adult
Spleen Rates	49	90	85	72	68
Parasite Rates	29	79	66	40	37
Examined	90	98	38	68	177

The proportions of species were as follows :—*P. falciparum* 40, *P. malariae* 11, *P. vivax* three. There was a notable difference in the parasite rates, as well as in parasite infestation, with the seasons, especially in adults, in whom the parasite rates rose from 16 to 49 per cent. The parasite counts are shown later in this paper (Table XIX).

6. SWEET 1933. Mysore, India

Over 4,000 examinations over a period of two years formed the basis of these records, in a rice-growing area of Mysore. Some 80 per cent. of all deaths, and 50 per cent. of dispensary diagnoses, were attributed to malaria. The average anopheline infective density was about 0·01 per house, and the annual chance of infection less than one.

TABLE XVI.

Age Group	0–4	5–9	10–14	15–19	Adult
Spleen Rates	67	74	72	75	74
Parasite Rates	39	33	28	29	22
Examined	448	1,702	1,232	259	704

The parasite species were present in the following proportions : *P. vivax* 14, *P. malaria* 11, *P. falciparum* 4. (Many other examples belonging to this class of endemicity have been recorded in India, but they are not cited owing to their omission of observations on adults.)

7. EARLE 1939. Porto Rico

This study was based on some thousands of examinations in this West Indian island. Local epidemics were common, and attacks of cerebral malaria relatively frequent. People of all ages were liable to suffer from attacks.

Average catches of *Anopheles albimanus* varied from 2 to 40, and in view of the low infectivity found in this species it is probable that the chance of infection was less than once a year.

TABLE XVII.

Age Group ...	0–1	1–4	5–9	10–14	15–19	Adult
Spleen Rates ...	14	23	33	40	41	38
Parasite Rates ...	10	24	21	21	24	21
Examined ...	198	1,209	4,278	4,711	1,001	2,377

P. vivax and *falciparum* were present with about equal frequency. There was no marked difference in the distribution of high gametocyte and parasite counts, with age, except that in those of over 50 years of age they were somewhat lower.

Discussion of the Characteristics of Hyperendemicity

With the data given in the foregoing examples as a basis of discussion, the various characteristics and criteria of hyperendemicity may now be considered in more detail. They will be considered in the following order: (1) the conditions that produce it, namely infective anopheline density, (2) geographical variations in its prevalence, (3) the possible influence of race, (4) the effects on man in terms of illness, and (5) the characteristics of the indices by which hyperendemicity may be recognized.

1. *Infective Anopheline Density*

The examples given in Group A were all recorded in the tropics, and it is now apparent that such degrees of endemicity can occur only in areas where infection is both intense and continuous for the greater part of the year. A steady transmission during the whole year is found only under exceptional circumstances, but it is probable that some chance of infection must be present for nine to ten months of the year. In a typical house there will be 2 to 10 female vector mosquitoes always present, the numbers rising to a peak of 30 to 50 or more during three or four months of the year (it must be noted that the numbers actually caught by hand-catching will only be half of these figures). It may be that at times, especially during dry years, there will be no more than an average of one or less per house. In order to maintain transmission for the necessary period it is therefore essential that the anopheline species concerned should be very easily infected, so that a high sporozoite rate shall compensate for the periods of low infestation. In Brazil, SOPER and WILSON (1943) found that *Anopheles gambiae* was a much more efficient vector in nature than any of the indigenous *Anopheles*, and it is apparent that the general levels of infection recorded, under endemic conditions, in a species such as *A. darlingi* or *A. albimanus* are of a different order from those found in *A. gambiae* or *A. funestus*. On the other hand large numbers may of course to some extent counterbalance low infectivity.

Thus it is the *infective* anopheline density over the whole year which is the critical aetiological factor determining not only the development, but also the character, of hyperendemicity. TURNER and WALTON (1946) calculate that the frequency of infection required to produce a parasite rate of 98 per cent. is ten times a year. In the Kissy area on the fringes of Freetown, this rate was found when the infective anopheline density was of the order of 0·1 per room (spray catches), whereas in the centre of Freetown there was a parasite rate of 18 to 30 per cent. when the chance of infection was only once in two years. WILSON (1936) found that an infective density averaging 0·55 over the year (hand catches) gave 100 per cent. parasite rate by the age of six months. GARNHAM (*loc. cit.*) found a parasite rate of 90 per cent. at the end of the first

year when the anopheline infective density was 0·15 to 1·5 per hut. McCarthy (1941) recorded in Pemba an annual average infective density of 0·15 per room and a parasite rate of 95 per cent. in the second year of life.

In all the cases in which the data are sufficient, it is clear that the chance of infection is at least thirty times a year, and may be as high as a hundred or more times, well distributed over the year. By contrast, even if there is an expectation of as many infections in seasonal areas, which does not seem to be the case, these infections are concentrated in a short period, and cannot therefore maintain the continuous parasite infestation characteristic of truly hyperendemic areas.

Thus, for example, in Holland (Swellengrebel and de Buck 1938) the records of one house were as follows :—

Aug. 16 ...	*Anopheles atroparvus*	118	...	Infected 10
Sep. 20 ...		307	...	79
Oct. 17 ...		219	...	84
Nov. 27 ...		232	...	75
Dec. 17 ...		101	...	38
Dec. 30 ...		77	...	20

In a whole village the sporozoite rate was 3 per cent. from September to November, but as *Anopheles* stop taking blood in November, the season of transmission was reduced to two months in either case. In tropical areas affected by an epidemic the infectivity of *A. sundaicus* may rise equally high, as for example in Java and Sumatra, where the normal 1 to 7 per cent. may rise to the figure of 63 infected in 171, as recorded by Swellengrebel and Swellengrebel-de Graaf (1919) ; but such a rise is only temporary.

2. *Geographical Distribution*

It is evident that the most widespread area in which true hyperendemicity is to be found lies in the African continent, and there within the tropics. But we have also been able to quote examples from India (where it was originally described), from the Far East and New Guinea, and from Surinam in South America. There are quite wide regions in India where malarial intensity is of this order, and summary records obtained during World War II seem to indicate clearly that it is quite frequently to be found in the Pacific (Bang *et al.*, 1947).

Yet for the most part malaria in India, where it has been so widely studied, is of a lesser endemicity, and while the records show how much the people may suffer from malaria, this is in itself one of the chief indices of the intermittent nature of transmission. At the same time it may be noted that anopheline infectivity is in general of a lower order than is commonly found in hyperendemic areas.

In the tropical parts of South and Central America, endemicity is even more generally of a lower order, and indeed at a lower level than is found in India. So far as present records indicate, the endemicities found lie outside the range of discussion of this paper, with the exception of the negroes of Surinam.

3. *Influence of Race*

Although the great field in which hyperendemic malaria has been found is among the races of Africa, its resulting adult immunity has now been demonstrated also among Indians, both aboriginal Dravidians (or Pre-Dravidians) and Aryans, among Melanesians, and the Moïs of Indo-China. Moreover, while in Africa the Bantu, Nilotic, Negro and Hamitic tribes all show examples of fully developed immunity, there are plenty of examples of extreme susceptibility among at least some of these racial groups.

The evidence is as yet too incomplete to determine whether the characteristics of this state of immunity are wholly dependent upon circumstances of infection, or whether only some races are capable of developing it ; but there can be

little doubt that the adult freedom from attacks can only be achieved when the frequency of infection reaches a certain level. There is clear evidence (DOWNS, GILLETTE and SHANNON, 1943; RICE and WATSON, 1943) that Africans and Caucasians react differently to induced infections of malaria, and the endemic indices of these two races in the same locality in North America were shown, by BARBER and KOMP (1929), to be different, though in the latter case an economic factor may have played a part. The possible existence of racial tolerance is also discussed briefly in the succeeding section.

4. *Morbidity Due to Hyperendemic Malaria*

Infant Morbidity

A survey of the literature reveals an extraordinary diversity of opinion on this subject. MACDONALD (1945) states that malaria in infancy is always accompanied by severe sickness, and WILSON (1936) showed how rapidly the physical condition of the children deteriorated for a period on infection with malaria. On the other hand Malcolm WATSON (1933) found that among the original indigenous races of India, in spite of carrying a high parasite load and much enlarged spleens, the children looked perfectly healthy and would have been able to take a prize at any baby show, and GARNHAM (1949) in Kavirondo, Kenya, noted that both the initial and continuing malaria infections were accompanied by little or no impairment in health. Is it possible to reconcile these different opinions? The following factors must be borne in mind.

(*a*) Is the malaria truly hyperendemic? If it is not, as in Ceylon (BRIERCLIFFE, 1935), a very severe (but not hyperendemic) type of malaria will cause much sickness and a high infant mortality.

(*b*) Are the statements based on direct observations, or only on general impressions? It is easy to be misled by the fact that a child is showing numerous parasites in the blood, and to ascribe any symptoms found to malaria. Every young child in a hyperendemic locality will inevitably be heavily parasitized, so a positive blood slide is no more a guide to the aetiology of the illness than the colour of the eyes. Garnham (1949) proved that in 52 infants infected with malaria and supposed to have died from the disease, this was true in only 17, the remainder having died from meningitis, pneumonia and other diseases. On the other hand malaria may be a contributory factor in determining a fatal result from other primary causes of death. All observations on this subject must therefore be made in a critical spirit; each child should be watched from birth, and detailed examinations carried out periodically.

(*c*) Are there other factors contributing to the pathogenicity or its absence in young children? TROWELL (1942) found that if nutrition is at a high level the children suffered very little from malaria; if there is much under-nourishment then malaria can get the upper hand. Other extrinsic factors probably play a part also, such as the introduction of foreign strains of plasmodia, in adults as well as in children.

(*d*) What treatment, if any, has been given? It is suggested that quinine given even in minute dosages may be responsible for the mildness of the symptoms.

The usual course of events under hyperendemic conditions is probably as follows. On infection the indigenous infant reacts comparatively mildly to the disease; it does not have convulsions and die, as would a child of an exotic race, but it loses its healthy placidity and becomes ill. Eventually a number of these children die, but the percentage is much lower than is often stated. The remainder jump the parasitic hurdle, and by the age of two or three years, while still in the later stage of acute infestation, manage to get along happily with their plasmodia.

Adult Morbidity

The great reduction in the parasite load that is found among immune communities as life advances, is presumptive evidence that there is little if any morbidity during adult life. On the other hand constant reinfection must involve some extra load on the immune mechanism, and a hidden subclinical handicap to health may exist. The question arises as to what degree of lack of energy or output this may induce, and attempts have been made to assess this handicap if it exists.

CHRISTOPHERS (1924) found the various people whom he studied to be free from sickness ; FARINAUD and PROST (1939) noted a contrast between the ill-health of the more susceptible immigrant Annamites and the well-being of the immune Moïs living in the same area ; in South Africa SWELLENGREBEL, ANNECKE and DE MEILLON (1931), observed that those Africans who had been brought up in malarious areas could be contrasted with the more recent immigrants in respect of their almost complete freedom from illness attributable to malaria.

A more extended attempt to assess morbidity was made by WILSON (1936) in Tanganyika. Among the people examined there was no complaint of fever from adults and, of some hundreds of temperatures regularly taken, only one showed pyrexia. The haemoglobin level, although always low, was notably reduced only during the first three years of life, and again in old age when the ankylostome infections become more prominent. CHRISTOPHERS (1924) found that the haemoglobin level was actually less in those with a lower degree of parasitaemia than in those with a higher.

It is common experience in hyperendemic areas in Africa that the incidence of " fever " is no greater during the periods at which transmission is known to be occurring more actively than when it is at a low ebb, and findings of parasitaemia show the same uniformity. On the other hand where there is more marked seasonal malaria transmission, adult parasitaemia is found to be more fluctuant, and BOURGUIGNON (1944) at Elisabethville in the Belgian Congo records an increase of positive films from 10 per cent. of those examined in the dry season to 40 per cent. in the transmission season.

The Course of Infection Summarized

Different forms of tolerance are apparently responsible for the reaction to malaria of both adults and children. It has been suggested by HACKETT (1941), WALTON (1947) and others that at birth a passive immunity is transmitted through the heavily infected and highly phagocytic placenta to the newborn child. This helps the infant to resist the first infection and to find time to develop gradually the acquired immunity, which goes through two stages, described by CHRISTOPHERS (1924) and again by SERGENT & SERGENT (1950), namely acute infestation and immune infestation. The process is influenced throughout by a racial tolerance to the disease, developed through the course of centuries, during which the more susceptible members of the race have been eliminated and the less susceptible have survived. Figure 1 illustrates diagrammatically the development of these three factors. It must be emphasized that the maintenance of the state of near commensalism which is reached in hyperendemic areas is wholly dependent upon the continuing existence of the factors originally responsible for it. If for some reason or other, the infant misses the advantage of the combination of transmitted passive with early acquired immunity, he will react much more unfavourably to the disease ; if the adult is no longer exposed to infecting bites, premunition will retrogress and he will become ill on reinfection, or if control measures are applied for a time, there will be a gradual loss of collective immunity.

Hypothetical Diagram of the Factors in the Immunity of Individuals of Hyperendemic Communities

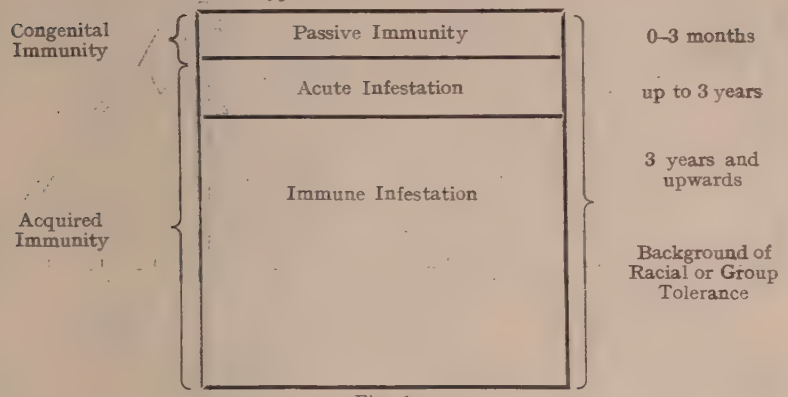


Fig. 1.

5. *Indices of Endemicity*

In considering the endemic indices, spleen and parasite rates and parasite infestation, the most characteristic features are to be sought in the relationships of these three indices throughout life ; but for the sake of clarity they must first be discussed severally. Some of the data given in the preceding examples are compared in Table XVIII.

TABLE XVIII

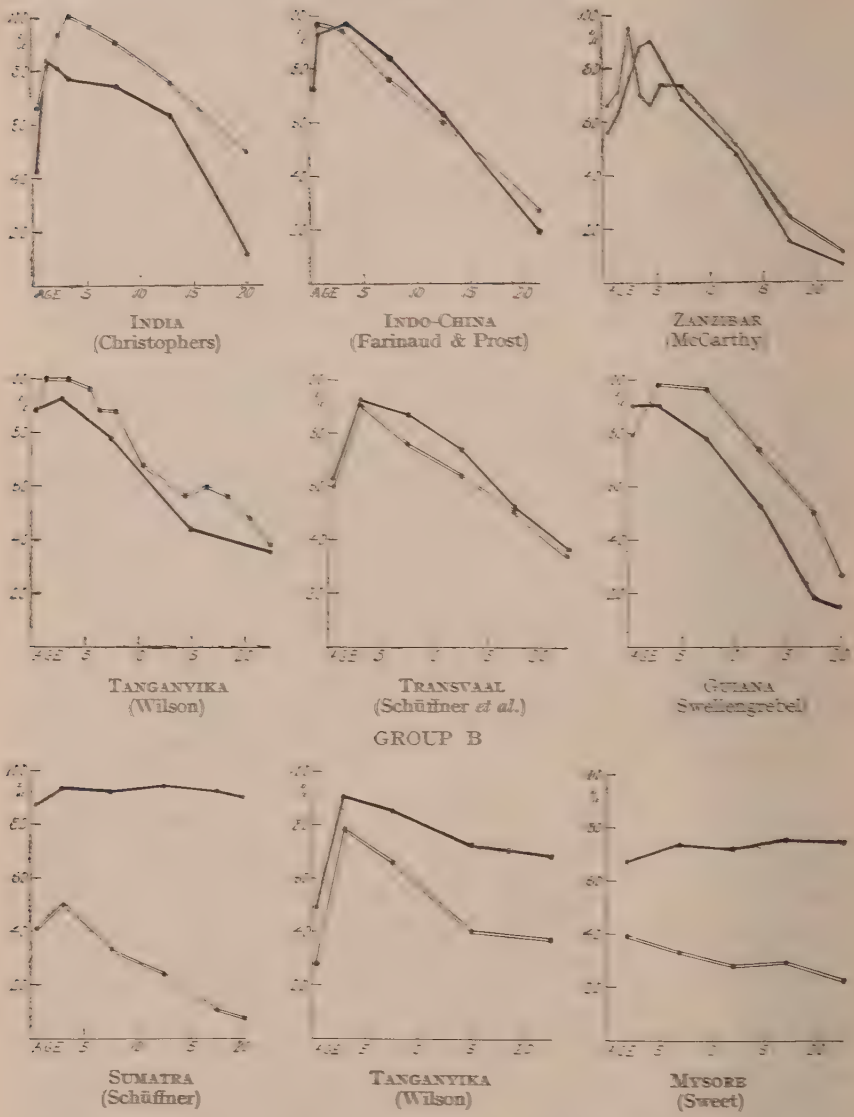
Spleen and Parasite Rates in Hyperendemic and Highly Endemic Localities

Age Groups	0–1		1–4 1–5 2–5		6–10 5– 8 5– 9		11–20 9–15 11–25		Adult, Over 16	
	S.R.	P.R.	S.R.	P.R.	S.R.	P.R.	S.R.	P.R.	S.R.	P.R.
A. *Hyperendemic*										
Indo-China ...	83	80	97	95	84	76	63	60	19	27
Nigeria		29		94		94		83		49
Zanzibar ...	56	40	87	74	68	63	33	42	6	11
Tanganyika ...	89	88	93	99	77	80	44	56	39	45
Transvaal ...	63	60	92	91	87	76	62	57	46	34
Guiana	90	79	90	98	78	96	42	66	15	26
B. *Highly Endemic*										
New Guinea ...	93	76	99	93	97	69	87	36	69	29
Greece ...	25	56	79	64	100	40			93	57
Tanganyika ...	49	29	90	79	85	66	72	40	68	37
Mysore ...			67	39	74	33			74	22
Porto Rico ...	4	10	23	24	33	21	41	22	38	21

S.R. = Spleen Rate. P.R. = Parasite Rate.

Fig. 2.

GROUP A



Spleen and Parasite Rates in Hyperendemic (Group A) and Highly Endemic (Group B) Localities.

The graphs differ slightly from the results shown in the preceding tables, in that rates at intermediate ages (when available) have been incorporated. This difference is of particular relevance to the discussion in the later section of this paper on the Definition of Hyperendemicity.

The Spleen Rates

On the whole spleen rates provide a good measure of malarial endemicity, but before placing any reliance on a given rate it must be assessed critically, bearing in mind the possibility of other endemic diseases such as kala azar or schistosomiasis, and in children the epidemic diseases such as measles. Moreover the spleen rate in childhood alone is liable to mislead, unless it is considered in relation to the rate at other ages.

In all the examples given in Group A, there occurs a rapid rise in the spleen rate to a maximum level before the age of two years. During the second year it reaches a peak of something over 90 per cent. Thereafter there begins a steady decline to a low level of 40 per cent. or less in adult life.

There is a corresponding variation in spleen size, with the greatest average enlarged spleen in infancy. There is a tendency to an increase in the average spleen in middle age, but this may be to some extent a reflection of other infections. It is not profitable to discuss this matter of spleen size any further, owing to the lack of comparable observations.

MACDONALD (1931) has pointed out that the spleen rate in children is directly related to the age of maximum intensity of malaria in children, and thus to the rapidity with which tolerance is developed. The common factor in these Group A records given above is the early rise of the spleen rate to its maximum level, and the great reduction in the spleen rate in adults as compared with children. This contrasts with the records in Group B, where splenomegaly persisted in adult life, at the same, or at a higher, level than in the children.

Parasite Rate and Parasite Infestation

As in the case of the spleen rates, there is in Group A a rapid rise with age in the parasite rates to a maximum at or before the end of the first year, usually earlier than the peak of the spleen rate. At this maximum the parasite rate closely approaches, or reaches, 100 per cent., depending to some slight extent on the season of examination. The true infection rate (as opposed to the rate found at a single examination) is of course always 100 per cent. In Group A it is only in the infants that there is any seasonal change in the parasite rates.

The subsequent decline with age is somewhat more gradual than is that of the spleen rate, and in general it remains at a higher level, so that even in adult life a rate of 30 to 40 per cent. is usual. But the actual rate recorded at this age depends very much more on the amount of time given to the examination than in the case of children, since parasites are extremely scanty.

It is thus in the reduction in the numbers of parasites present, rather than in the frequency of the finding of parasites, that the greatest difference is found between children and adults of an "immune" community. It is therefore by the counting of parasites that the development of immunity may most effectively be followed and estimated.

CHRISTOPHERS (1924) was the first to adopt this measurement, and although the methods of counting used were different, his results and those of MCCARTHY, BARBER and OLINGER, and WILSON (1936) are compared below, together with those from another African community of a lesser degree of endemicity.

In hyperendemic areas, seasonal variation in the parasite counts is found only in the youngest children, up to about the age of two years. At older ages there is no variation in hyperendemic areas, whereas in communities of lesser endemicity there is a wide variation at all ages, counts being doubled or trebled during the transmission season as compared with the dry season.

Unfortunately no further comparable records appear to be available. We believe, however, that it is by the use of this method that much of the uncertainty that remains, as to the relative endemicity of different areas in widely separated parts of the world, might be resolved.

TABLE XIX.

Average Parasite Counts per cu. mm.

Age	CHRISTOPHERS Singhbhum	McCARTHY Pemba	BARBER* OLINGER Lagos	WILSON Digo	WILSON Wet Season Nyiramba
0–1 ...	4,690	7,430	3,000	7,880	14,140
1 ...	10,660		3,520	7,180	
2 ...	7,120	3,630	4,600	4,730	
3 ...	1,080	2,430	2,110	2,700	4,790
4 ...	730	2,110	1,980	1,800	
5 ...	810	3,020		830	
6 ...			830		
7 ...				490	2,140
8 ...	820	790			
9 ...					
10 ...			380		
11 ...					
12 ...					
13 ...					
14 ...	130	400	320	300	1,460
15 ...					
16 ...			190		
Adult ...	120	200		180	1,010

Arithmetic mean counts to nearest ten.
*Approximate figures calculated from the numbers given per field.

Effect of Interference

There is little evidence on the effect of the removal of the regular premunizing dose of infection, and it is impossible to forecast the exact reaction in any community. One of us (D. B. W.) has suggested that a major control scheme in a hyperendemic area in Africa might be followed by malaria of a different character, and of much more serious import, than that to which we are accustomed, *if control measures slackened*. Let us assume that all the houses in 5,000 square miles of hyperendemic country were treated with residual insecticides, and that this process were repeated, say three times a year for five years. It is probable that malaria would disappear from the area in a year or two, and by the end of five years the population would have lost much of its immunity if practical extermination of the vector anophelines had been achieved. In the belief that the disease had vanished, funds might be diverted to other purposes or for some other reason slackening of control might ensue. Vector *Anopheles* might then return insidiously into the area through inadequately guarded channels of approach, and with no warning an explosive epidemic of malaria carried by *A. gambiae* would sweep the countryside. Actual mortality might not be high among the adult population, although they would always be exposed to an increased risk on going from protected country, for example to work, elsewhere. But the more precarious balance in the younger children might well lead to many fatalities in this group.

WALTON (1949) concluded that the reduced rate of infection which followed the successful application of control measures in Freetown led to a loss of immunity, as shown by increased severity of parasite infestation and symptoms. FINDLAY (1949) recorded an increasing incidence of blackwater fever among African troops in successive years of World War II, and attributed this occurrence to the protection against malarial attacks that was offered to them. The evidence on which these authors base their conclusions seems to us to be suggestive but inconclusive. We ourselves have observed the differences in

the type of reaction to malaria occurring in Africans moved from a hyperendemic zone, where they suffered little from malaria, to a zone that was malaria-free. When they returned home again they might suffer from severe, though never fatal, fever.

We believe that it would be unwise, in regions of hyperendemicity in tropical Africa or elsewhere, to embark lightly upon unrestricted measures of control. On the other hand an experimental control on a large scale is most desirable, for its results would provide a scientific basis for future malaria control work in rural districts ; always provided that it were a fully controlled experiment, and its results measured by adequate human indices (see final section of this paper).

By contrast with the caution that we believe to be desirable in the case of hyperendemic communities, a very different attitude must without question be adopted where immunity is not fully developed, and in such cases there can be no argument as to the desirability of pushing forward with preventive measures : eradication if that be economically possible, or, failing that, any degree of control that may be feasible. This applies not only to those communities that consist for the most part of susceptible people, but almost equally to those who have no more than a partial degree of resistance to the effects of infection with malaria.

Definition of Hyperendemicity

In the light of the observations so far recorded and discussed, an attempt may be made to define what may properly be regarded as hyperendemicity, and to indicate how its presence may be recognized.

We regard hyperendemicity as a state quite distinct from all lesser degrees of endemicity, demanding for its production such an intensity of transmission that a high degree of tolerance to the effects of reinfection is induced in those who experience its effects over a number of years. This tolerance is accompanied by a capacity to contend rapidly and effectively with the parasites of the locality concerned.

The frequency of transmission that is necessary to induce this state is almost certainly not less than 30 times a year, and may amount to a 100 or more times. In the presence of this intensity of infection, newcomers, usually infants, suffer severe attacks of malaria, and a proportion, between 10 and 20 per thousand of the infant population, die annually in the absence of treatment. After 18 months they are out of danger, and from then on and throughout life there is no increase in the parasite rate, or in the parasite load, as a result of seasonal heightened intensity of transmission.

It remains uncertain whether in this state the individual may be physically handicapped or, if he is, what such handicap may amount to ; but it seems to us that the disadvantage from which he may suffer is of a different category from that of an inhabitant of a locality of even a high endemicity, yet not reaching the level of true hyperendemicity. The immune do not suffer from pernicious attacks after infancy, there is apparently no effect on fertility, congenital malaria is unknown, and under no circumstances can epidemics occur.

When frequency of infection, and therefore endemicity, falls short of this high level, there are regular attacks for much of life, as evidenced by the heightened parasite load and parasite rates met with during the transmission season, and by the demand for treatment : moreover these attacks may be of a pernicious character. As a corollary to this liability to attacks, there has been observed a reduction in fertility, and the occurrence of congenital malaria. Above all, epidemics, with all their implications, are liable to occur.

Although we have not discussed this aspect, it should be mentioned that this picture of hyperendemicity is associated specifically with *Plasmodium*

falciparum, although *P. vivax*, *P. malariae* and *P. ovale* play a varying and minor rôle. Conversely, places in which *P. vivax* malaria predominates are not truly hyperendemic. The *P. falciparum* gametocyte rate is high in children, in young children as much as 30 to 40 per cent., while in adults it is only 2 to 5 per cent. This contrasts with the seasonal incidence of gametocytes in endemic areas.

True hyperendemicity, as we understand it, may then be recognized by the following criteria. A high spleen rate in children, of the order of 70 per cent. or more, with a peak of over 90 per cent. during the second year, and a lessening spleen rate during the rest of life. A parasite rate that is constant at all seasons, but reaches a peak approaching 100 per cent. early in the second year, and then also declines throughout life at first rapidly then more slowly. The parasite rates are approximately equal to or greater than the spleen rates at the corresponding ages. The parasite infestation or count declines rapidly between the second and fifth years and then more slowly, and shows a seasonal variation only in the youngest children. *P. falciparum* is the predominating parasite species, and human infectors of this species are mainly found among children.

Outstanding Problems

It must be clear to the reader of the foregoing summary of present knowledge that there are still many gaps to be filled in our understanding of hyperendemic malaria, some of them of critical significance in the formulation of a rational approach to this endemic state, that holds such a large proportion of tropical peoples in its thrall. We draw attention to the chief of the needs.

1. *Epidemiological Studies*

On account of the diversity that exists, and the prevailing uncertainty as to the basis of this diversity, not only between widely separated areas of the world, but also often within a quite small compass, there is still a great need for comparable studies of such diverse conditions. These should cover not only the endemic zones, but also those that are truly hyperendemic. The essence of such studies should be the correlation of human and anopheline data, for each side of the picture is required for the understanding of the other.

The studies should include :—

- Spleen and parasite rates at all ages and at different seasons [parasite rates by 3-monthly age groups up to 2 years] ;
- Determination of the parasite infestation (or count) at different ages and seasons ;
- Observation of anopheline density and infectivity throughout the year, or at least during typical seasons.

2. *Estimation of Morbidity*

Precise ascertainment is required of the exact cost of the stage of acute infestation, in terms of infant morbidity and mortality. In order to obtain it comparative studies will again be required : in other words, comparative and critical vital statistics must be obtained from population groups living in various parts of the world and under differing degrees of malarial endemicity.

Of even greater importance is the elucidation of the effect of the stage of immune infestation on the adult. The difficulty of this undertaking is recognized, and there appears to us to be but one method of approach, namely by the elimination of malaria from a hyperendemic area, and by then determining the effect of this elimination, while the other endemic diseases that are always present in such areas still remain.

For such an assessment it will be necessary to make observations on :—

Mental capacity ;

Physical capacity, including tests of energy and endurance, and the effect on such activities as agriculture ;

Biological standards, such as haemoglobin levels and vital capacity ;

and to search for any remote or hidden pathological effects, after determining the incidence of other endemic diseases.

3. *Anopheline Control*

Whether control is necessary or desirable depends on the answer to the preceding investigation. On the other hand experimental control must be undertaken in order to provide the answer to that investigation. The two questions are thus indissolubly bound together. Whether again control is an economic possibility under hyperendemic conditions and with present methods still remains to be ascertained.

4. *Treatment*

The optimum dosage of antimalarial drugs, and the choice of drug, in the treatment of infants, in order so to modify their attacks that mortality is eliminated and morbidity reduced to a minimum (without extermination of parasites), is in urgent need of study ; for at present there is wide diversity of practice in this respect.

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SUMMARY OF RECENT ABSTRACTS*

VII. HELMINTHIASIS

General

A survey of dogs in Chengtu showed that many of them carried cestodes and trematodes of importance to man (HSU, p. 376).

An apparatus for concentrating trematode eggs in faecal suspensions is described by LEIPER (p. 950).

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1949, v. 46. References are given under the names of the authors quoted, and the pages on which the abstracts are printed.

DESCHIENS (p. 850) discusses the pathogenic properties of toxic substances in worms. The discussion should be read in full. With POIRIER (p. 851) he has experimented on injection of extracts of various worms, and hydatid fluid, into animals. They were all toxic, and produced effects analogous to those produced by histamine.

The radiological appearances produced by various helminthic infections of the lung are described by RAVELLI (p. 1055).

LEÃO and EICHBAUM (p. 54) have used the oil of *Anacardium occidentale* (cashew oil) for the intestinal helminthic parasites of dogs, with some success. EICHBAUM (p. 54) shows that the vermicidal action of hexylresorcinol is enhanced if it is given (in animal experiments) together with preparations of cashew oil. Mucus inhibits its action, but very slightly if detergents are present.

TREMATODES

Schistosomiasis, general.—SHOUSHA (p. 845) refers to the heavy incidence of schistosomiasis in Egypt. He thinks that it is hopeless to attempt to eradicate it by treatment, or to control it by attempting to prevent pollution or by propaganda. Eradication of snails is possible, and he outlines the methods used.

In discussing the difficulty of diagnosis of schistosomiasis, GELFAND (p. 266) states that the intradermal test is not specific, and that the finding of ova in urine or faeces may be difficult. Rectal biopsy is important, and may be positive when no ova can be found otherwise ; eggs of *S. haematobium* are found in rectal biopsy material in 40 per cent. of cases of infection with that worm. Biopsy of the bladder is positive in 90 per cent. of cases of *S. haematobium* infection, even when there is no visible abnormality. Cystoscopy is important, and radiography has its uses. He (p. 267) describes in detail his technique for rectal biopsy, and the results he has obtained.

GELFAND and ROSS (p. 378) found that eggs of *S. haematobium* and *S. mansoni* may very frequently be found in snips of bladder and rectum taken at post mortem examination of persons with schistosomiasis in S. Rhodesia. They therefore consider that biopsy of bladder or rectum is warranted in clinical practice to establish the diagnosis of schistosomiasis. *S. haematobium* was diagnosed by rectal snip in 60 per cent. of these cases. Pure *S. mansoni* infections are rare in that region of S. Rhodesia. GELFAND (p. 644) has studied the distribution of ova of *S. haematobium* and *S. mansoni* in bladder, rectum, and tissues of the genital tract of 30 African women on whom post mortem examinations were made. The bladder and rectum contained ova in every case, and the various parts of the genital tract in 15–28 cases. The effect may be serious if there is a heavy concentration of eggs in the Fallopian tubes. GELFAND and ROSS (p. 846) hold that the best method of assessing the incidence of schistosomiasis is to digest in 10 per cent. KOH the entire rectum and bladder of all persons on whom autopsy is performed. They have done this on 150 subjects in S. Rhodesia, and have found infection in 98 per cent. Almost all had *S. haematobium*, about half had *S. mansoni* and about half had both. *S. haematobium* was found in the rectum in 112 cases (in eight of these in the rectum only), and *S. mansoni* was found in the bladder in five (in three in the bladder only).

ERFAN (p. 57) gives an account of pulmonary schistosomiasis, which affects about one-third of the infected people of Egypt. The pulmonary invasion occurs early, and more eggs are found of *S. haematobium* than of *S. mansoni*. The lesions are parenchymatous or arterial ; the former occur round bronchioles and alveoli, and the latter may lead to failure of the right heart, as in Ayerza's disease. Specific diagnosis rests on finding eggs in the sputum, but this is rarely

possible. X-ray may reveal nodules along the branches of the pulmonary artery, and increased hilar shadows. Eosinophilia is more pronounced in cases with lung involvement. ERFAN *et al.* (p. 643) report a study of 49 cases of pulmonary schistosomiasis in Egypt. The symptoms appear insidiously, and develop to dyspnoea, cough, weakness, palpitation and thoracic pain. There may be signs of pulmonary hypertension, and enlargement of liver and spleen, with ascites and oedema of the legs. Antimony treatment may cause some improvement, but may give rise to focal reactions. TIDY (p. 847) discusses Ayerza's disease (pulmonary endarteritis) in relation to schistosomiasis and silicosis in Egypt and Brazil.

MEESER *et al.* (p. 1153) describe a miracidiascope and discuss its use in diagnosis in field work, and for the determination of viability of ova.

VOGEL and MINNING (p. 1154) have observed that when cercariae of schistosomes are placed in serum, or dilutions of serum, from persons infected with schistosomes (even of other species) there forms in a short time a thin membrane around each cercaria. The test appears to be non-specific as regards the three schistosomes of man, and to be given by the sera of cattle infected with *Fasciola hepatica*, but in man no false positives were found in uninfected persons. The membrane probably is not part of the immunity mechanism. [See also PAPIRMEISTER and BANG, below.]

ABDOU and GRACE (p. 269) discuss the results of splenectomy for bilharzial splenomegaly. They have studied the records of 42 patients in Egypt on whom the operation was performed, and note that the results on the whole have been good. Treatment with tartar emetic in the early stages of splenic enlargement due to this cause is important. DA SILVA (p. 759) has performed splenectomy on 60 persons with splenomegaly due to schistosomiasis ; the indications were portal tension, abdominal distension, leucopenia and repeated haematemesis. HIDAYAT (p. 1058) discusses Egyptian splenomegaly (in most cases due to schistosomiasis) and its treatment, including splenectomy.

BLAIR *et al.* (p. 556) have used relatively high doses of Miracil D (up to 25 mgm. per kgm. body weight daily in two doses) given by mouth during a period of five days, for treatment of children infected with *S. haematobium*. This is more successful than the former dosage of 4 mgm. per kgm. daily for two to three weeks, but a dose of 15 mgm. per kgm. is as effective as 25 mgm. *S. mansoni* is much more resistant than *S. haematobium* to this treatment. BLAIR *et al.* (p. 848) report on the treatment of Africans with Miracil D administered by mouth. Details are given of the varying dosages used, and the results (usually favourable) are described. [See also ALVES, below.]

HALAWANI *et al.* (p. 753) have studied *in vitro* the action of Miracil D in serum on *S. mansoni*, and its effect in the treatment of *S. haematobium* infections. It was not successful in completely eradicating the infection. [In the original abstract the quantities of the drug maintained in the serum are expressed as mgm. per ml. ; they should have been expressed as μgm. per ml.]

RAIL (p. 557) has used an intensive course with sodium antimonyl tartrate for the treatment of schistosomiasis, both urinary and intestinal, in S. Rhodesia. TALAAT and SHOAIB (p. 645) write favourably of the intensive treatment in Egypt of schistosomiasis [type not stated] with tartar emetic.

Fantorin is the name of a substance similar to Fouadin, which has been used successfully by HALAWANI (p. 380) in schistosomiasis.

SCHWETZ (p. 1156) suggests a new classification of the Planorbidae of the Belgian Congo, which is a simplification of the subject ; he has reduced the snails which are important from the point of view of schistosomiasis to four varieties of *Biomphalaria alexandrina* (*viz.*, *pfeifferi*, *tanganyicensis*, *stanleyi* and

choanomphala). He (p. 1157) has found cercariae having the characters of *S. mansoni* in all these varieties.

COWPER (p. 265) has experimented with various substances to kill *Planorbis corneus*, the English pond snail. This snail appeared to be more resistant than *Bulinus* or *Physopsis* to copper salts, but copper acetate was lethal at 1·0 p.p.m., and copper carbonate or chloride at 5 p.p.m. Of copper ores, malachite gave the best results. Toxic substances were found in extracts of certain plants, including *Balanites*.

ABDEL AZIM and BARLOW (p. 150) give an account of the work of the Bilharzia Snail Destruction Section in Egypt, where the object is not to eradicate the snails from irrigation canals, but to reduce their numbers to such an extent that the completion of the life cycle of the schistosomes is difficult. Copper sulphate is largely used at an initial concentration of 30 p.p.m., and in canals where this is not possible, removal of snails by palm-leaf traps is undertaken. The authors describe certain experiments on the possibility of infecting foreign strains of snails with local schistosomes, and other experiments. AZIM and AYYAD (p. 646) have used palm-leaf traps, which they describe, for collecting snails in running water and in ponds, in Egypt. They are useful in water in which copper sulphate treatment is inappropriate.

In the *East African Medical Journal* (p. 151) is a note by an Administrative Officer on the need for cooperation between medical and administrative offices in the control of schistosomiasis in East Africa.

AZIM and WATSON (p. 946) have investigated several methods of packing snails for transport by air ; they found that perforated wooden boxes containing damp mud and moist water plants were the most satisfactory.

Schistosoma haematobium infections.—DE AZEVEDO *et al.* (p. 1056) describe a newly discovered small focus of *S. haematobium* infection in Portugal, where *Planorbis dufourii* appears to be the intermediate host.

A hitherto unknown focus of *S. haematobium* infection has been discovered by MARILL *et al.* (p. 1153) at Fondouk, Algeria. The infections were contracted in a river which had been dammed to form an irrigation reservoir.

PIPKIN and RIZK (p. 845) report the discovery of two foci of *S. haematobium* infection in northern Syria.

WATSON (p. 554) states that urinary schistosomiasis is common in Iraq, where *Bulinus truncatus* is the intermediate host. This snail breeds in the shallow irrigation ditches, and the disease is very prevalent in the rice-field areas. WATSON and ALI AL HAMAMI (p. 846) found *S. haematobium* infection in 27 per cent. of male, and 14 per cent. of female, out-patients attending hospital for other complaints in Bagdad. The disease is probably transmitted within the city.

WALKER (p. 151) reports infection with *S. haematobium* in 60–70 per cent. of schoolboys in the coastal areas of Kenya. Conditions are very favourable for the snail host in swamps, dams and pools in dry river beds. DEWHURST (p. 555) found a considerably greater proportion of urines positive for *S. haematobium* in African troops from Nyasaland and N. Rhodesia than in those from further north.

GELFAND (p. 56), by examination of the bladders of 50 Africans in S. Rhodesia who had had vesical schistosomiasis and who had died, showed that the disease may be present even if there are no macroscopic signs to be detected on cystoscopy. He has been successful in detecting ova in snips taken from bladders during cystoscopic examination, and recommends this procedure in suspected cases ; otherwise the disease cannot be completely excluded.

PRATES (p. 1056) discusses the possibility that *S. haematobium* infection in Portuguese East Africa is concerned in the aetiology of primary carcinoma of the liver.

DE SA and MONTEIRO (p. 947) report a case of urinary schistosomiasis in India.

GOODLIFFE and BLAIR (p. 55) show that the act of hatching of miracidia of *S. haematobium* is extremely quick, about 1 /48th of a second.

BARLOW (p. 752) considers that the female *S. haematobium* deposits its eggs in a cyst in the bladder wall close to the surface, which is ruptured in the act of micturition, and that the worm refills the cyst after it has been emptied. Eggs are most abundant in the last part of urine passed. The author gives the reasoning and observations on which he bases his opinion.

BENNIE (p. 555) produces evidence to show that the best time to examine urine for eggs of *S. haematobium* is in the afternoon. The number of eggs is closely related to the amount of exercise taken just before micturition and the practice of examining early morning urine, therefore, is not satisfactory. Viable eggs disappeared from the urine of one patient shortly after completion of a course of Miracil D.

In a comprehensive paper, KIRKALDY-WILLIS (p. 266) discusses the value of cystoscopy in the diagnosis of urinary schistosomiasis. He considers it essential not only in diagnosis but in control of treatment. The paper contains much detail, and should be read in full.

BARLOW and MELENEY (p. 553) give a vivid account of a severe infection with *S. haematobium* which the senior author voluntarily induced in himself. Notable points were the early appearance of eggs in the seminal fluid, their recovery from the scrotal skin and the demonstration of a pair of adult worms there, an increase in egg production when the infection became chronic, and the failure of two courses of Fouadin to eradicate the infection, though potassium antimony tartrate subsequently did so. Eggs were constantly found in both urine and faeces, the numbers reaching a peak in the period six to ten months after infection. The first treatment was given ten months after infection, but cure was not obtained until 18 months after infection.

In S. Rhodesia ALVES (p. 947) has had success in treatment of urinary schistosomiasis with Miracil D by mouth, in courses lasting three to five days to a total of 60–75 mgm. per kilo. of body weight.

STANDEN (p. 946) reports on a study of the ecological requirements of *Planorbis boissyi* and *Bulinus truncatus* in laboratory culture ; for details the original should be consulted.

DA MOTA (p. 1057) has not found that benzene hexachloride is as useful as copper sulphate in the control of *P. dufourii*, the intermediate host of *S. haematobium* in Portugal.

S. mansoni infection.—In a record of seven years' routine examinations of faeces of people living in Nairobi, Kenya, ROBERTS (p. 641) reports that *S. mansoni* ranks high as a cause of ill-health, and that it is found from the coast to a level of 8,000 feet. The chief snail host is *Biomphalaria pfeifferi*, but *Bulinus tropicus* is also a host. Other important worm infections found were *Taenia saginata*, *Ascaris* and *Necator*.

On examination of a single specimen of faeces from each of 411 gold miners of the Belgian Congo, JANSSEN (p. 754) found 287 positive for eggs of *S. mansoni*. Two-thirds of those known to harbour it had enlargement of the liver, and eggs were found, with inflammatory and fibroblastic reaction, in biopsy specimens of the liver.

MEIRA (p. 847) gives the distribution of schistosomiasis in Brazil. NEVES (p. 643) gives an account of *S. mansoni* infection in the State of Espirito Santo, Brazil, where *Australorbis centimetralis* is the intermediate host. A new focus of *S. mansoni* infection has been found in Brazil by COUTINHO and PESSÔA (p. 1058). *Australorbis glabratus* was present in the area.

GÖNNERT (p. 1154) discusses the body-covering of *S. mansoni*.

MALDONADO and ACOSTA-MATIENZO (p. 377) have studied the miracidium of *S. mansoni*. Most of the eggs hatch within eight hours in water under laboratory conditions ; the average life span is five to six hours ; of miracidia exposed to snails immediately after hatching, 71·8 per cent. penetrated, but of those exposed after eight to nine hours of free life, none was able to penetrate.

SCHREIBER and SCHUBERT (p. 754) have shown that when *Australorbis glabratus* are exposed to five to seven miracidia of *S. mansoni* at 28°–30°C., more than half become infected. At 24°–26°C. half of the miracidia die within eight hours. Snails emit cercariae to an average of 698 each day, but half the snails are dead in four weeks after first emission of cercariae. All cercariae incubated at 30°C. were dead in 20 hours.

PAPIRMEISTER and BANG (p. 55) show that when cercariae of *S. mansoni* newly emerged from *Australorbis glabratus* are exposed at room temperature to dilutions of serum from monkeys or patients with schistosomiasis, a precipitate forms around them. This does not happen if the serum has been heated to 56°C. for half an hour, but does so if guineapig complement is added.

Hyaluronidase is an enzyme which is elaborated by certain bacteria, by means of which they are able to spread in the tissues. LEVINE *et al.* (p. 56) have found that it can be detected in cercariae of *S. mansoni*, but they do not claim that it is the only enzyme concerned in cercarial penetration of the skin. A study of the time taken by cercariae of *S. mansoni* to penetrate the skin of hamsters and mice is reported by HITCHCOCK (p. 949).

From experiments conducted on various animals, MOORE *et al.* (p. 948) conclude that mice and hamsters are the most suitable for experimental infections with *S. mansoni*.

WATSON and AZIM (p. 948) discuss the different methods of infecting mice with *S. mansoni* ; they prefer partial immersion. They note the importance of preventing pollution of the water by urine and faeces of the mice, which are lethal to cercariae.

JAFFÉ, MAYER and PIFANO (p. 756) have infected animals with male *S. mansoni*, and found that the lesions produced in liver, spleen, etc., were the same as in animals infected with both sexes. The lesions cannot be ascribed to the presence of eggs, but rather to toxins secreted by the adult worms. PIFANO (p. 268) reports experiments with *Australorbis glabratus* infected with *S. mansoni*, which suggest that those larval forms which are potentially masculine in the snails are more resistant to adverse conditions than those potentially feminine, in that they tend to survive longer when the snails are subjected to the climatic conditions of the dry season in Venezuela.

Hermaphroditic males of *S. mansoni* are described by SHORT (p. 55) from Porto Rico.

JAFFÉ (p. 269) discusses the pathology of *S. mansoni* infection, and the processes by which the tissues are stimulated to produce the morbid changes. Allergic reactions to the parasites or eggs may play a part in these reactions.

Ova of *S. mansoni* in the wall of the gall bladder, with inflammatory reaction, have been found by ARMBRUST (p. 1060).

MAYER and PIFANO (p. 757) describe the preparation of an extract of male and female *S. mansoni*, which they have used with success for an intradermal test in man. They obtained positive results in 95 per cent. of a group of patients, but none in controls, though they promise a report on the results in cases of *F. hepatica* infection. The same authors (p. 758) have used the complement-fixation test (Fairley) with success in differentiating schistosomiasis from other conditions.

The value of liver and rectal biopsy in the diagnosis of *S. mansoni* infection is demonstrated by OTTOLINA and ATENCIO (p. 759). MEIRA and SOARES

(p. 949) write of the value of rectal biopsy in the diagnosis of *S. mansoni* infection. Examination of eggs of *S. mansoni* found in rectal biopsy material may give important information on the course of the disease. Drugs which are effective act on the adult females, and tend to prevent oviposition (DA SILVA, p. 377).

SCHUBERT *et al.* (p. 646) have tested several antimonial drugs in the treatment of experimental *S. mansoni* infection of mice. Details should be sought in the original. RODRIGUEZ-MOLINA *et al.* (p. 558) write favourably of the immediate results obtained with Anthiomaline in *S. mansoni* infections, but comment on the importance of follow-up studies.

An account of the original tests of the Miracil group of drugs, in *S. mansoni* infection of white mice and monkeys, is given by KIKUTH and GÖNNERT (p. 481).

Chloramine in proportions of 0·3 to 0·89 parts per million has a definite effect in inactivating the miracidia of *S. mansoni* (BIAGGI and PIRAZZI, p. 647).

LUTTERMOSER and CASTELLANOS (p. 755) discuss the control of *A. glabratus* in part of Venezuela where conditions in the rivers, and pollution by sewage, produce conditions favourable to the snails. They note that sand filtration alone will not remove cercariae from infested water. LUTTERMOSER (p. 756) shows that *A. glabratus* could not develop in part of Venezuela where water flow in irrigation canals was good, and where the canals were kept clean.

S. japonicum infection.—Although there is a focus of true *S. japonicum* infection in the Lake Lindoe region of Celebes, FAUST and BONNE (p. 59) were unable to find snails of the genus *Oncomelania* in a survey they made there.

PESIGAN (p. 152) reports a newly-discovered focus of schistosomiasis in Mindanao, Philippine Islands, where *Oncomelania quadrasi* was found, but none infected.

OLIVIER (p. 482) writes of cases of *S. japonicum* infection of children in a known endemic area of Japan, where *Oncomelania nosophora* is the intermediate host.

MAO (p. 559) writes on the epidemiology of *S. japonicum* infection in China ; various animals are named as reservoir hosts, and 17 species of *Oncomelania* and allied snails as intermediate hosts. He describes the habits of these snails, and the circumstances in which human infection takes place. MAO and LI (p. 559) suggest an improved basis for the taxonomic classification of the snails.

The high infection rates with *S. japonicum* in parts of China (especially Kiangsu and Chekiang) are discussed by LI (p. 60). A few cases of *S. japonicum* infection in inhabitants of the Chengtu plain are reported by BEST and WU (p. 648).

The optimum conditions for the hatching of eggs of *S. japonicum* are discussed by INGALLS *et al.* (p. 950).

The discharge of cercariae of *S. japonicum* from *Oncomelania quadrasi* takes place largely at night, and continues for two to three consecutive nights, after which it is discontinued for about the same length of time, and then recommences. This cycle is continued, and BAUMAN *et al.* (p. 270) note that a critical factor is the alkalinity of the water (optimum *p*H 7·6).

In a description of the life history of *Oncomelania hupensis*, VOGEL (p. 1158) makes the point that its eggs are covered with a mineral slime which is derived from a clay in its normal habitat, without which it cannot multiply. If there is no clay in the soil, this snail (and consequently schistosomiasis) is not found. The snail is easily maintained in the laboratory, and easily infected with *S. japonicum*. The original paper contains exact instructions for maintaining it.

CHANG *et al.* (p. 378) have collected from the literature information on cerebral schistosomiasis, and report two cases of their own, in both of which eggs of *S. japonicum* were found in biopsy specimens taken from the brain.

Changes in the electrocardiographic records resulting from treatment with antimonial drugs are recorded by TARR (p. 61) from a group of patients suffering from *S. japonicum* infection. They were observed in almost all patients

examined, and were usually reversible ; they showed a distinct pattern but in no case was there clinical evidence of cardiac dysfunction.

Drugs of the Miracil group were used by VOGEL and MINNING (p. 481) in *S. japonicum* infections of mice and monkeys, but they were not effective, though under similar conditions they were effective against *S. mansoni*.

Other schistosome infections.—HUNTER *et al.* (p. 1061) record the two species of *Trichobilharzia* responsible for swimmers' itch in Seattle, U.S.A., and their known snail hosts. The cercariae of *Trichobilharzia stagnicolae*, which cause dermatitis in the United States, can penetrate the skin while it is submerged in water ; they do not need an evaporating film of water to stimulate penetration (OLIVIER, p. 849).

OLIVIER (p. 849) has demonstrated a phenomenon of sensitization developing after repeated exposure to cercariae of schistosomes which produce dermatitis.

Other trematode infections.—A family epidemic of *F. hepatica* infection is recorded by SÉDALLIAN *et al.* (p. 1159) in France. In treatment the drug glucantime was used, with some success. DA FONSECA and DE AZEVEDO (p. 62) record a case of *F. hepatica* infection in a patient from Madeira, probably contracted as a result of the consumption of watercress.

An outbreak of infection with *Fasciola hepatica* is reported by ARENAS *et al.* from Cuba. The people were in the habit of eating much watercress, and snail intermediate hosts of the fluke were found in association with this. The clinical features included fever, anorexia, weakness, enlargement of the liver and eosinophilia ; ova were found in almost half the patients when the duodenal sound was used.

OLSEN (p. 62) found *Fasciola hepatica* in 32 per cent. of jack rabbits and 20 per cent. of cotton-tail rabbits in Texas. These animals, therefore, probably play an important part in transmission of this fluke.

KENDALL (p. 850) has shown that *Lymnaea stagnalis* can be infected with *F. hepatica*.

KOURI (p. 271) discusses the diagnosis of *F. hepatica* infection, laying stress upon the prolonged fever with high eosinophilia. The symptoms of cholecystitis are common to other diseases, and though the finding of ova in the faeces is conclusive, they may easily be missed. He discusses methods of preventing infection.

In *F. hepatica* infestation MAZZOTTI (p. 760) has obtained frank positive results with an intradermal test in which an antigen prepared from *Fasciola* was used.

CHANCE and MANSOUR (p. 760) have made a kymographic study of the action of drugs on *F. hepatica*, which should be studied in the original.

GALLIARD (p. 153) records two cases of infection with *Fasciolopsis buski* in Tonking. This infection, rare in man in that country, is common in the pig. The aquatic plants on which the cercariae encyst are in Tonking eaten cooked, and the envelope is opened with a knife, not by the teeth as in some other areas ; this probably explains the rarity of the infection in man. There are probably, however, a number of light infections which are missed.

KOENIGSTEIN (p. 648) reports a large outbreak of *Clonorchis sinensis* infection of a community of 20,000 displaced Europeans living in Shanghai. The origin was pickled fresh-water fish, and 20–30 per cent. of the people were affected. The clinical picture was one of acute infection, with fever, enlargement of the liver and eosinophilia. Faeces showed eggs after 3–4 weeks, and the symptoms subsided slowly, though malaise and some degree of eosinophilia remained. Treatment was unsatisfactory.

In the treatment of *Clonorchis sinensis* infection NARDONE (p. 152) gives Fouadin and gentian violet, but in advanced cases he also drains the gall

bladder externally. Adult worms and eggs are passed out in this way, and drainage is continued for 20 days.

TILLMAN and PHILLIPS (p. 649) describe the clinical course of pulmonary paragonimiasis in Filipino soldiers. Cough and haemoptysis were constant, and ova were found at some time in the sputum of all the 12 patients. Radiological changes and physical signs were present, yet the patients seemed relatively well. Emetine gave the best results in treatment, but was not always successful in eliminating the ova.

DESCHIENS and PICK (p. 482) have preserved *Watsonius watsoni* alive for 18 days in an artificial medium.

Five species of echinostomes from human autopsy material studied in the Malayan Archipelago are described by BONNE *et al.* (p. 63). They have all been discussed previously in papers abstracted in this *Bulletin*. Only one, *Echinostoma lindoensis*, is specially adapted to man, the others are chiefly parasitic in rats and birds, though they do occur in man.

CACCIAPUOTI (p. 63) describes a trematode, probably a new species of *Pseudoamphistoma*, discovered at autopsy of a man in Ethiopia.

CESTODES

JOYEUX (p. 380) discusses immunity in relation to the Cestodes which infect man.

Tapeworm proglottides have been found in the appendices of two persons by DESCHIENS and BABLET (p. 65). They acted as enclosed foreign bodies.

HALAWANI *et al.* (p. 650) have used mepacrine (15 mgm. per kilo. bodyweight), followed by castor oil 2 hours later, with success in the treatment of tapeworm infestation.

OBRADOR (p. 381) discusses the clinical aspects of cerebral cysticercosis as he saw it in Mexico. The main symptoms are in 4 groups—epileptiform attacks, signs of increased intracranial pressure, mental disturbances and loss of vision. He has found that examination of the cerebrospinal fluid may give useful evidence, and he has used a complement fixation test for serum, in which the antigen was an alcoholic extract of cysticerci from the pig. In comment, NAPIER discusses some points of difference between British and American experience of this.

A series of experiments conducted by NEWTON *et al.* (p. 851) have shown that for sewage contaminated with eggs of *T. saginata*, the usual treatment processes (except sand filtration) cannot be relied upon to produce effluent or sludge free from viable eggs.

SCHLANGER and SCHLANGER (p. 382) have written on hydatid disease and its X-ray appearances. The article should be read in full because of the illustrations, round which it is written.

Six cases of *Hymenolepis nana* infestation are reported from France by COUTELEN *et al.* (p. 951). RISQUEZ-IRIBARREN and ORTIZ (p. 273) report a case of infestation with *Hymenolepis diminuta* in Venezuela.

A case of coenurus infection of the spinal cord of a girl in Britain is reported by CRUSZ (p. 65); the infection was probably contracted in Wales. LANDELLS (p. 561) reports that a coenurus cyst (of *Multiceps multiceps*) was removed from the spinal cord of a child who had developed spastic paraplegia. A case of coenurus infection is described by HARANT and MIDROUILLET (p. 950) in France.

A case of infestation with *Dipylidium caninum* is reported by OSIMANI (p. 66).

LEÓN (p. 272) discusses the species of *Raillietina* which infest man, and describes *R. equatoriensis* in detail. It is found in Ecuador. The howler

monkey has been found to be the normal host of *Raillietina demerariensis*, which is capable of infecting man (JOYEUX and BAER, p. 951).

BAYLIS (p. 952) reports *Inermicapsifer arvicanthidis* from a child in Kenya. This cestode has been reported from various rodents in Africa, and infestation of man is probably accidental. Its life history is not known. The possibility exists that this species is identical with *I. cubensis*, which may have been introduced into Cuba from West Africa. BAER *et al.* (p. 952) give an account of *Inermicapsifer cubensis*. They think that its normal host is an animal, and that man becomes infested by accident.

SAUNDERS (p. 677) reports *Diphyllobothrium latum* in the people, and the dogs, of Fort Chipewyan, Alberta, Canada, and thinks that this worm is widely distributed to the north. *Diphyllobothrium* infestation, and other parasitic infections, were found by BROWN *et al.* (p. 376) in Canadian Eskimos.

In four cases of anaemia due to *D. latum*, response to treatment with folic acid was dramatic (VON BONSDORFF, p. 154). ESKOLA (p. 483) has studied the reticulocyte response to treatment with liver preparations, in patients with *Diphyllobothrium* anaemia, after removal of the worms by *Filix mas*. The same author (p. 483) reports a study of the bone marrow in this form of anaemia, and in controls. The original abstracts of these papers should be read in full.

GALLIARD (p. 560) has studied the site of penetration, the migration and the lesions caused by plerocercoid larvae of *D. mansoni* after they have been swallowed by various animals. Details should be sought in the original.

The incidence of infection with plerocercoids of *D. mansoni*, of amphibians and reptiles in Tonking, is reported by GALLIARD (p. 64), who shows that some 60 per cent. of *Rana tigrina* are affected.

A cystic sparganosis in an African from Gabon is reported by HARANT *et al.* (p. 761) ; the species could not be determined. *Charles Wilcocks*

[*To be continued*]

MALARIA

SWELLENGREBEL, N. H. **The Malaria Epidemic of 1943–1946 in the Province of North-Holland.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 445–64, 3 graphs. Discussion 461–76 SHORTT, H. E. (President) ; MACDONALD, G. ; COVELL, G. ; GORDON, R. M. ; SHUTE, P. G. ; PERRY, E. L. ; GARNHAM, P. C. C. ; ROBERTSON, Muriel ; SWELLENGREBEL, N. H. (in reply).

The author presents a thoughtful, stimulating account of a recent epidemic of malaria in North Holland, discussing it in the light of observations that have been made during the last half-century. His long and intimate acquaintance with the subject adds greatly to the value of what he writes.

The first part of the paper deals with fact. The only vector is *Anopheles maculipennis* and nearly all the malaria is benign tertian, due to *Plasmodium vivax*. In the village of Wormerveer, malaria has been observed for very nearly fifty years, and it is evident that there were peaks in 1901, 1922 and 1946, at intervals of 21 to 24 years. The tables seem to show that the epidemic rises gradually over two or three years and that malaria never affects more than a small proportion of the total population, even though the figure at the peak is ten to thirty times that when the incidence is lowest. It is a curious fact that even in the small and uniform country of North Holland the peaks of

malaria are strictly local : for instance the village of Uitgeest, less than four miles from Wormerveer, had its own peak of malaria in 1935 with a 16 per cent. incidence. As outbreaks are not synchronous in different villages it is difficult to reach any conclusion as to what may be going to happen : indeed, if one selects two places and applies a certain measure to one of them, one cannot assume that malaria would have been about equal in both of them if nothing had been done. At first sight, then, it looks as if several causes might be operative in causing outbreaks, which appear to be random. The author, however, rejects that view, pointing out that as the outbreaks are almost regular in their periodicity one must assume that there is a single underlying explanation. He examines the evidence, but cannot relate the recent outbreak to conditions arising from the war, or to great increases in the density of Anopheline mosquitoes. With some hesitation he thinks that the outbreaks are due to loss of immunity in the human population. At first sight it is difficult to accept this explanation because even at a peak a large proportion of the people are not affected ; but if one examines the figures with sufficient care one finds that the outbreaks occur in small foci and it is probable that within one of these the rate of incidence is very high. From these foci the disease may spread and make a noticeable and more widely distributed epidemic. [The argument is very close and subtle and does not readily lend itself to being summarized.]

In the north of Holland clinical malaria is a disease of late spring and early summer, generally declining in August. This incidence is not due to relapses : it seems probable that the majority of persons attacked, though infected in the previous August, have had no symptoms of malaria until the following spring or summer : occasionally, however, clinical cases are produced in the autumn soon after they have been infected. From this it follows that there is no correlation between the season when malaria is common and when mosquitoes are abundant, indeed infected *Anopheles* are extremely rare in spring and early summer and are generally encountered from the latter part of August to October, when they reach their maximum.

Different types of control have been practised in North Holland as the years have passed. As the mosquito breeds in the drainage system, which is essential to the agricultural life of the country, control by the destruction of larvae is expensive : indeed at one time it was thought to be impossible. From 1920 onwards the general policy was to attack the hibernating mosquitoes, in the hope that this would reduce the numbers which laid eggs in the spring, as indeed it must have done : as the method was by spraying with a solution of lysol, it was not very effective. From 1926 pyrethrum sprays were brought into use, in houses as well as in stables, pigsties and so forth. Inasmuch as the spraying to be effective has to be carried out at a season when mosquitoes are not common nor annoying, it was found essential to put it in the hands of an official body and not of the householder. This was done from 1936 onwards, with particular attention to houses in which cases of malaria had occurred. Domestic spraying with DDT was introduced in 1945, the work being concentrated on dangerous houses in the majority of cases, though all houses have been sprayed in one extensive part of the city of Amsterdam.

Because local peaks of malaria may occur in different villages in different years, it is by no means easy to relate the different control policies to the disease or to say how successful any of the work may have been. It seems, however, that domestic spraying with DDT, combined with a good intelligence system, is greatly reducing malaria throughout the area.

The author's lecture stimulated a discussion of unusual interest during which valuable contributions were made on the subject of epidemic periodicity and of malaria in England. *P. A. Buxton*

DE FLUITER, H. J. Malaria en malaria-overbrengers in de krijgsgevangenkampen Chungkai en Tamuang (W. Thailand). [**Malaria and Malaria Vectors in the Chungkai and Tamuang Prisoner-of-War Camps (West Siam).**] *Ent. Ber.* Amsterdam. 1948, v. 12, No. 283. pp. 270–75. [Summary taken from *Rev. Applied Entom.* Ser. B. 1950, Feb., Pt. 2, 21.]

The author gives the results of blood tests for malaria parasites carried out in 1944 and 1945 on the population of two hospital camps for prisoners of war on the river Mekong, in the west of Siam, and a list of 20 species of *Anopheles* recorded from that country. Anopheline breeding places were numerous in and round the camps, and the species taken in them were *A. vagus*, Dön., and *A. kochi*, Dön., in stagnant water and ricefields, *A. tessellatus*, Theo., in an overgrown pool, *A. philippinensis*, Ludl., in rice-fields, ditches and excavations, *A. barbirostris*, Wulp, in ditches after one of the camps had been flooded by the river, *A. minimus*, Theo., in a ditch, and *A. culicifacies*, Giles, in ditches and rice-fields. Larvae of *A. vagus* were very numerous, those of *A. kochi* somewhat less so, and the other species scarce. Adults of *A. vagus* and *A. philippinensis* were attracted to man in trapping experiments, and engorged females of *A. barbirostris* were taken in huts. The species that appeared from the literature likely to act as vectors of malaria were *A. barbirostris*, *A. minimus* and *A. culicifacies*, but although many of the persons in the camps were found to be infected, no fresh cases occurred.

CHOW, C. Y. & BALFOUR, M. C. **The Natural Infection and Seasonal Prevalence of Anopheles Mosquitoes in Chefang and Vicinity, Yunnan-Burma Border.** *Chinese Med. J.* Shanghai. 1949, Aug., v. 67, No. 8, 405–13.

The mosquitoes used in these studies were collected from houses and stables in Chefang and neighbouring villages situated near the Yunnan-Burma border. Altogether 39,115 female anopheline mosquitoes of 13 species were dissected during the 25 months from March 1940 to March 1942. The only one found naturally infected with malaria parasites was *Anopheles minimus* of which 27,603 were dissected giving an infection rate of 1·1 per cent. This species was shown to be infected throughout the year ; highest rates (up to 9·0 per cent.) were obtained in the months of July to November and the lowest (up to 0·7 per cent.) in January and February. The rate in the town was higher than in the villages (1·8 and 0·6 per cent. respectively), thus agreeing with the fact that more malaria occurred among town dwellers. *A. minimus* was the predominant species and reached its peak of prevalence in October and November.

No malaria infections were found among 11,512 dissections of the other anophelines and it is unlikely that any species other than *A. minimus* is of any importance in malaria transmission in this area. *H. S. Leeson*

FROHNE, W. C., WEATHERSBEE, A. A., WILLIAMS, G. M. & HART, J. W. **Observations of the Persistence of *Plasmodium* Infections in *Anopheles* Mosquitoes in an Area of Low Observed Human Malaria Parasitemia in South Carolina.** *J. National Malaria Soc.* 1950, Mar., v. 9, No. 1, 10–24, 1 chart & 2 maps.

The authors are interested in the transmission of malaria when infection has become rare in the human community. In the southern United States there is a positive correlation between the sporozoite rate in *Anopheles* and the proportion of people showing parasites in the blood, and one would suppose that this is general. The present investigation was carried out in an area in South Carolina

in which houses had been sprayed with DDT so that parasites had almost disappeared from the blood of the human beings by 1946. But the sporozoite rate in *Anopheles quadrimaculatus* remained relatively high in 1947 and 1948 : in the latter year seven infected *Anopheles* were found during six months, though no malaria parasites were found in 12,000 blood films taken from 2,000 individuals.

Several explanations are considered, but none is accepted : the parasite in the *Anopheles* might be that of some bird or mammal other than man, but after investigation no evidence was found to support this view : it was conceivable but very unlikely that there were undetected infected human beings in the area : it seems that *Anopheles* may be infected from a man in whose blood gametocytes are very rare, but that hardly covers the present case. The authors have reported the facts fully ; they are of great interest and rather disquieting.

P. A. Buxton

DEANE, L. M. & DAMASCENO, R. G. Altura de pouso das fêmeas de *Anopheles darlingi* e de *Anopheles aquasalis* nas paredes internas das casas. [**The Level at which Female** *Anopheles darlingi* **and** *A. aquasalis* **rest on the Inside of Walls of Houses.**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1948, Dec., v. 2, No. 2, 501–8, 1 graph. English summary.

The authors are interested in house spraying, and therefore in the exact place chosen by female *Anopheles* which rest in houses.

They have captured large numbers of *Anopheles* at night inside houses at all seasons of the year, in cities in the State of Pará, Brazil. About 90 per cent. of female *A. darlingi* and *aquasalis* rest on the lowest two metres of a wall, and about 60 per cent. in the lowest metre.

P. A. Buxton

GALVÃO, A. B. Do diagnóstico diferencial entre *A* (*N*) *strodei* e *A* (*N*) *pessoai* na fase larvária. [**The Differentiation between** *Anopheles strodei* **and** *Anopheles pessoai* **in their Larval Stages.**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1950, Jan. 15, v. 2, No. 1, 38–48, 2 figs. [10 refs.]

The English summary appended to the paper is as follows :—

" The author presents comparative study of the number and disposition of the pecten's teeth of larvae of *A* (*N*) *strodei* and *A* (*N*) *pessoai*, reaching the conclusion that differential diagnosis among species can be made by those structures."

COUTINHO, J. O. Contribuição para o estudo do sub-gênero *Kerteszia* com a descrição do macho de *Anopheles* (*Kerteszia*) *bambusicolus* Komp, 1937. [**Contribution to the Study of the Subgenus** *Kerteszia*, **with a Description of the Male of** *A.* (*K.*) *bambusicolus.*] *Livro Homen. Ferreira d'Almeida.* São Paulo. 1946. pp. 149–53, 2 figs. [Summary taken from *Rev. Applied Entom.* Ser. B. 1950, Mar., v. 38, Pt. 3, 46.]

Investigations on species of *Anopheles* of the subgenus *Kerteszia* as vectors of malaria in forest regions in the States of Paraná, Santa Catarina and Rio Grande do Sul, in southern Brazil, were begun in 1943. The four species so far definitely recorded there are *A. cruzi*, D. & K., *A. bellator*, D. & K., *A. homunculus*, Komp, and *A. bambusicolus*, Komp. All breed in bromeliads, and the first two are efficient vectors of malaria and the only vectors known on the coast. Since the male of *A. bambusicolus* has not previously been described, descriptions of the adults and male genitalia are given. This species has not been found to be a vector.

BIANCO, I. Ricerche sulle resistenze osmotiche delle emazie nei malarici. [**Study of Red Cell Resistance in Malaria Patients.**] *Riv. di Malariologia.* 1949, Dec., v. 28, No. 6, 331–42. [11 refs.] English summary.

The English summary appended to the paper is as follows :—

" The red cells resistance and the conditions of blood in 71 patients with acute malaria infection were examined. Four healthy persons, receiving quinine and atebrin, served as control. Before drug administration red cells resistance in malaria patients is greater than in normal subjects, but it shifts towards lower values after administration of quinine and atebrin. Other aspects of blood did not show a substantial change in malaria patients or in the control group after drug administration. In cases of progressive paralysis, treated by malaria, the red cells resistance appeared increased after the first attacks, but soon reverted to previous values and, with the subsiding of infection through quinine therapy, attained lower values.

" Interpretation as for a direct action of the drug is to be discarded. The behaviour of red cells resistance suggests a destruction of the weaker erythrocytes after the first paroxysms and a successive circulation of red cells with lower resistance : or it is due to an altered erythropoiesis or to an exaggerated activity of the spleen."

VON HALLER, E. Superinfektionen mit dem homologen Stamm bei der Malaria tertiana. Beitrag für das Verständnis der Malaria-Immunität. [**Superinfection with the Homologous Strain of *Plasmodium vivax*. Conceptions of Malarial Immunity.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1949, Dec., v. 1, No. 3, 328–39, 7 figs. [Numerous refs.]

Superinfection with the homologous strain of *Plasmodium vivax* transmitted by mosquito bite was successfully attempted during the long period free from fever between the primary attack and relapse. Superinfection was found to be possible so long as the defence mechanisms of the individual had not been fully developed. The presence of the tissue forms alone during the latent period probably does not give rise to protection against the erythrocytic parasite phase. Superinfection can produce clinical manifestations in some cases in which erythrocytic forms of parasites are present. The response is dependent on the grade of bodily resistance developed. The author discusses the relation of his results to the notions of " premunition " and " immunity to infection."

B. G. Maegraith

MOHR, W. Röntgenologische Erfassung der Milz- und Lebergrösse bei Malaria. [**Radiological Identification of Enlargement of the Liver and Spleen in Malaria.**] Reprinted from *Fortschr. Röntgenstr.* 1949, Nov., v. 72, No. 1, 93–5, 2 figs. [11 refs.]

The author states that the shadows of both the liver and spleen may often be clearly seen during radiological examination of the abdomen in the dorso-vertical position. The spleen shadow can be measured in this way and the effect on it of antimalarial treatment observed. The expert can use this method to check on the cruder method of palpation. *B. G. Maegraith*

ECKSTEIN, A. Malaria im Kindesalter. [**Malaria in Children.**] *Acta Med. Turcica.* 1949, June, v. 1, No. 2, 7–28.

[See this *Bulletin*, 1949, v. 46, 881.]

GÓMEZ HERRERA, H. Un caso de paludismo congenito. [**A Case of Congenital Malaria.**] *Rev. Facul. de Med.* Bogota. 1950, Feb., v. 18, No. 8, 546–9, 1 chart.

A case in Colombia due to *P. vivax.*

V. HALLER, E. Über die Möglichkeit der Provokation von Rückfällen bei latenter Malaria tertiana. [**The Possibility of producing Relapses in Latent Benign Tertian Malaria.**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1949, Dec., v. 1, No. 3, 340–54, 10 charts. [21 refs.]

In this paper some factors which might provoke a relapse of benign tertian malaria are discussed. There is a brief summary of literature and an account, of experiments designed to determine whether various provocative procedures, including the injection of adrenaline and of pyrogenic compounds such as suspensions of Ducrey's bacillus, or Pyrifer, could bring about an increase of erythrocytic parasites in cases where these were already present or cause a mobilization of the parasitic tissue phase. Full experimental details are given.

The author concludes that pyrogens have little or no stimulant effect on either erythrocytic or tissue phases of benign tertian malaria. He suggests that artificially induced fever has, if anything, a depressing effect on parasite development. Adrenaline injection temporarily increases the number of parasites in the peripheral blood but is probably not associated with increased parasite division. The time of appearance of a relapse is a function of the maturation of the tissue forms and the associated development of the asexual cycle. The resistance of the body is an important factor. A previously acquired resistance hinders the development of the erythrocytic phase. Factors which affect the development of defence mechanisms lead to relapse only in the presence of erythrocytic parasites. The pyrogenic substances used by the author do not act in this way. *B. G. Maegraith*

WINCKEL, C. W. F., KOK, K., DE JONGH, D. K. & KNOPPERS, A. T. **Plasma Concentration and Excretion of Quinine Carbonate and Ethylcarbonate in Man, as compared with Quinine Sulphate.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 90–96, 1 graph. [21 refs.]

About the beginning of this century, two tasteless esters of quinine, the ethylcarbonate (euquinine), containing 82 per cent. of the alkaloidal base, and the carbonate (aristoquine) containing 96 per cent. of the base, were produced commercially, in order to avoid the unpleasant bitterness of the salts commonly used. Widely different views on the therapeutic value of these two substances were held by clinicians. The senior author had found previously that the first named substance was as useful as quinine hydrochloride, whereas the second was slower in action and less efficient. In order to explain the difference in action the present authors have measured plasma levels of alkaloid as well as urinary and faecal excretion after administration of quinine sulphate and the above two substances in turn to five patients. Each received a single dose by mouth of 10 mgm. per kilo of weight of the sulphate or ethylcarbonate, or 20 mgm. of carbonate, calculated as quinine base. Repeated doses of half the above amounts were also used twice daily for three days. The method of BRODIE *et al.* [this *Bulletin*, 1947, v. 44, 793] was used for plasma determinations, and consists in extraction of the alkaloid with purified ethylene dichloride, followed by conversion to sulphate and comparison with standards in a fluorimeter. Faecal samples were homogenized, extracted with acid and converted to the salt as was the base present in urine, prior to estimation as above.

It was found that the plasma concentration of quinine after administration of sulphate and ethylcarbonate was similar and considerably higher than that of carbonate, in spite of the larger dosage of the latter. Much of the carbonate is excreted in faeces but very little in the urine compared with the two other substances. It therefore appears that the carbonate is poorly absorbed from the intestine compared with the sulphate or ethylcarbonate, which are taken up to nearly the same extent. *J. D. Fulton*

FLOCH, H. Tétanos post-quinique et vaccination antitétanique. [**Tetanus after Quinine Injections and the Question of Anti-tetanus Injection.**] *Bull. Acad. Nat. Méd.* 1949, v. 133, Nos. 21/22, 419–21.

The author again raises the question of compulsory anti-tetanic vaccination in the tropics. He and others have already reported cases of post-quinine tetanus and he considers that these only represent a small proportion of the cases that actually occur.

The value of anti-tetanic vaccination by the anatoxin of Ramon was proved in the second world war.

The greater frequency of tetanus in the tropics and especially in Guiana has been recognized since the Eighteenth Century. In some cases reported, the only possible route of entry of the bacillus was through a " jigger " infestation. In one case the author was able to isolate the tetanus bacillus from *Sarcopsylla penetrans* recovered from a case of tetanus. The question arises whether anti-tetanic serum should be given to every person who acquires a jigger in his foot.

The author reports four cases ; all the patients had received intramuscular injections of quinine salts. In each case symptoms developed within a week of the last injection and the patient died within two or three days despite vigorous anti-tetanic serum or serum-anatoxin therapy.

In three of the cases there was a local reaction after the injection, but it has been the experience of others that after aseptic injections of quinine the tetanus spores are carried by the blood or lymphatics to the traumatized focus caused by the quinine.

The author concludes that compulsory anti-tetanic vaccination would save many lives without any risk.

In the discussion, M. Pierre DELBET, referring to recent experience in Madagascar, said that, although the troops were given quinine from sterile ampoules prepared in France, cases of tetanus appeared. He believed that quinine reduced the activity of the leucocytes and allowed the tetanus bacilli, which had entered through abrasions in the feet, to multiply.

M. H. VINCENT, referring to his old experience, said that tetanus spores washed free of toxin introduced into a healthy animal were quite harmless, but, in animals who received small doses of quinine subcutaneously, subacute tetanus developed. No bacilli were found at the point of injection, but could be recovered from the area where quinine was injected. *L. E. Napier*

KOENIG, K. Die curative Wirkung von Plasmochin bei Malaria tertiana. [**The Therapeutic Effect of Plasmoquine in Benign Tertian Malaria.**] *Ztschr f. Tropenmed. u. Parasit.* Stuttgart. 1949, Dec., v. 1, No. 3, 420–37. [Numerous refs.]

The author has carefully reviewed the literature on the chemotherapeutic activity of plasmoquine [pamaquin] and some of the more recently introduced antimalarials in *P. vivax* malaria. He concludes that the successful prevention of relapses by the combined use of pamaquin and a schizonticidal drug such

as quinine, depends not so much on the synergic effect of the two drugs on the same phase of the parasite, but on parallel activity against morphologically and physiologically differing forms of the parasite. Pamaquin acts mainly on the tissue forms of *P. vivax* and acts on them better in the presence of the schizonticidal drug. Other 8-amino-quinolines may prove even more effective in combination with schizonticidal drugs. *B. G. Maegraith*

REY, H. & DE ZULUETA, J. **A Preliminary Trial of Paludrine Single-Dose Therapy in Columbia.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 531–4.

The authors report the results of treating 15 cases of malaria (eight *Plasmodium falciparum*, six *P. vivax* and one a mixed infection with *falciparum* and *vivax*) with a single dose of proguanil mgm. 300. All the patients had a history of previous untreated attacks of malaria. Two of them were children aged three years, and these received the same dose as the adults, but no toxic after-effects were noted. In 14 out of the 15 cases fever was controlled and asexual parasites disappeared from the peripheral blood within three days, but one of the patients with a *falciparum* infection failed to respond to the treatment. This patient had a higher parasite count (144,000 per cmm. of blood) than any other in the series. The authors recommend this form of treatment for the control of malaria attacks in rural areas where a complete course of treatment is seldom practicable, and where most of the population possess a certain degree of immunity to the disease. Detailed results are given for all 15 patients. *G. Covell*

MANISCALCO, G. Risultati ed osservazioni su sette campagne antimalariche (1942–1948). [**Results of Seven Years' Antimalaria Campaign.**] *Riv. di Malariologia.* 1949, Dec., v. 28, No. 6, 349–56. English summary (7 lines).

The English summary appended to the paper is as follows :—

"The author reports the data of the antimalarial campaign carried out in San Carlo (Sicily) during 1942–48.

"Vectors were *A. maculipennis* var. *labranchiae*, *A. superpictus* and *A. bifurcatus*. Paris green was used for antilarval control and D.D.T. against adult mosquitoes. The results were highly satisfactory and a remarkable fall in malaria incidence was noticed. However eradication was not obtained and the author doubts if this will ever be possible."

REID, J. A., assisted by P. D. RAJAMONEY & L. R. CHELLAPPAH. **Field Experiments with DDT in Oil as an Anopheline Larvicide. Part I. On Still Water.** *Med. J. Malaya.* 1950, Mar., v. 4, No. 3, 219–33, 3 figs. (2 on pls.).

BUXTON [this *Bulletin*, 1946, v. 43, 305] and RIBBANDS [*ibid.*, 409] demonstrated the potency of DDT as an anopheline larvicide, a complete kill being attained with a dosage of an ounce or less per acre of water surface. Near Kuala Lumpur a block of six separate ditches, each with a plentiful growth of water hyacinth and abundant larvae, mostly of *Anopheles hyrcanus* and *A. philippinensis*, were treated with varying dosages of DDT or BHC [Gammexane] ; two similar ditches were left untouched as controls. Observations were made over a period of two years ; the technique of the experiments and full results are described. These results confirm that there is little residual action on the larvae by either DDT or BHC, indeed, with a dosage of less

than 2 oz. DDT per acre, many nearly full grown larvae were present by the sixth day after treatment. The authors recommend as the best preparation and dosage 4·3 oz. of DDT per acre applied as a 5 per cent. solution in Malariol [70 per cent. diesel oil, 30 per cent. gas oil] at 0.5 cc. per sq. yard (½ gallon per acre). This gave a 99 per cent. kill 24 hours after treatment and the number of fourth instar larvae on the sixth day was only one-third of the number before treatment. This dosage of DDT in Malariol had a slightly better lasting effect than plain Malariol at 12·5 cc. per sq. yard. BHC at 1·25 oz. of *gamma* isomer to the acre was a little inferior to DDT at 4·3 oz.

Although the authors record little difference between the results attained with plain Malariol and their recommended dosage of DDT in Malariol, the difference in costs of materials per acre is very marked ; the cost of DDT in oil is one-tenth that of plain Malariol.

[The principal difference between these recommendations and previous information is the striking increase in dosage of DDT per acre from one to over four ounces.] *R. Ford Tredre*

CONANT, V. **The Use of Tide-Gates for Larvae Control on the Salt Marshes.** *Proc. & Papers 17th Ann. Conf. California Mosquito Control Ass., Feb. 7–9, 1949.* 74–5.

DENGLER, H. P. **A High Capacity Low-Lift Pump.** *Ibid.* 75–6.

DORER, R. E. **Transportation on the Salt Marsh.** *Ibid.* 77.

RALEY, T. G. **Ground Power Spray Equipment.** *Ibid.* 77.

HENDERSON, J. M. **Minor Residual Drainage.** *Ibid.* 78–81.

STAGE, H. H. **Symposium : Recent Improvements and Experience in the Use of Aircraft in Mosquito Control.** *Proc. & Papers 17th Ann. Conf. California Mosquito Control Ass., Feb. 7–9, 1949.* 82.

SPERBECK, T. M. **Recent Improvements and Experience in the Use of Aircraft in Mosquito Control.** *Ibid.* 82–3.

HESS, A. D. **Developments in the Airplane Application of Mosquitocides by the Tennessee Valley Authority.** *Ibid.* 83–7.

GEIB, A. F. **Use of Airplanes in Mosquito Control in California.** *Ibid.* 87–9.

SPERBECK discusses the control of *Aëdes dorsalis* and *Anopheles freeborni* in rice-growing areas in the U.S.A. The addition of emulsible DDT at the pumps or canal head gates has been successful, but additional trials have been made of the application of DDT to the seed—usually after it has been soaked in water so that it has already germinated—which is then sown from aircraft.

Experiments were made in the addition of 10 per cent. DDT and DDD in wettable powder to the rice, and the effect on germination and growth were tested. Treated samples were at least as healthy as the controls. The method was then used in the field with DDT which was detected in the water 24 to 36 hours after sowing. The results in anopheline control have been promising and the experiments will be repeated.

Other work in the control of breeding by more standard methods of application from the air is described.

HESS gives a useful description of problems encountered in the Tennessee Valley where aerial application of DDT is a standard practice. Thermal

aerosols have given almost perfect control under favourable conditions, but become ineffective where excessive drift or unfavourable thermal stratification of the air occurs. Work has, therefore, been carried out on the most appropriate droplet size based on the mass median diameter (MMD). The term " aerosol " is applied to materials with an MMD below 50 μ, " mist spray " between 50 and 100 μ, " fine spray " between 100 and 200 μ, " medium spray " between 200 and 300, and " coarse spray " over 300 μ. The optimal size is considered to be an MMD of 75 μ. This can be produced by passage of solutions through modified exhaust venturis, but as this method produces some finer particles experiments have been made with standard spray nozzles at each wing tip. With conventional spray nozzles an MMD of 125 μ was obtainable. It was found that the droplet diameter is inversely proportional to the discharge pressure within the range 20 to 100 pounds per square inch, and the use of smaller nozzles with higher pressures is, therefore, proposed. An alternative method of definition of droplet size is described.

The lack of sufficiently sensitive methods for the assay of DDT has made some checking processes difficult. Experiments have been carried out in the addition of various readily assayed substances to the fluid ; the most promising are organic compounds of cadmium, the use of which is briefly described.

Geib discusses the technique of control of *Aëdes* and *Anopheles freeborni* in irrigated pastures, rice fields and other places. Sprays are preferred to aerosols, emulsions being preferred to solutions, and DDT to DDD. Recommended procedures are listed ; they include for the control of *Aëdes* the application of 0·4 lb. of DDT per acre in the form of half a gallon of 10 per cent. emulsion for light to medium vegetation, and 0·5 lb. per acre for heavy vegetation. For the control of *Anopheles freeborni* 0·025 lb. of DDT per acre is recommended, repeated every ten days. *G. Macdonald*

Alvarado, C. A., Coll, H. A. & Laguzzi, S. F. El programa de erradicación del paludismo en la República Argentina. Las fallas de la campaña de dedetización y organización del Servicio de Vigilancia. [**Programme of Malaria Eradication in the Argentine Republic : Failures of DDT and Organization of Control Service.**] *Bol. Oficina Sanitaria Panamericana.* 1950, Jan., v. 29, No. 1, 1–6.

In the second half of 1947 a programme of malaria control was put into operation in Argentina : the interiors of all houses in all the parts of the country in which malaria was endemic were to be sprayed with DDT. Remarkable success has been achieved. In the past the annual number of consultations for malaria averaged about 300,000, a high percentage of which concerned primary infection or re-infections. In the first six months of 1949, which included the season of maximum malaria incidence, the number of consultations was only 2,785 : of these only 134 concerned primary infections. The circumstances determining these 134 new infections were studied. Seventy-six of them (56·7 per cent.) had been acquired in dwellings that had not been sprayed with DDT. Some of these dwellings had been overlooked because of their isolation in the mountains. Others were temporary mobile structures. In 12 cases the dwellings were of such crude primitive construction as to preclude the possibility that DDT spray could afford adequate protection. In 24 cases the spraying had been done more than four months before malaria infection was acquired. In only 20 instances was no explanation forthcoming of the failure of DDT spraying to afford protection. These 20 cases occurred in 20 different houses in different places ; no other inmates were infected.

An account is given of the elaborate organization that has been set up to control, and assess the results of, the campaign. *Norman White*

CRUZ, W. O. Ação da acetilfenilhidrazina na infecção do Macaco Rhesus pelo "Plasmodium knowlesi". [**Action of Acetylphenylhydrazine in Rhesus Monkeys Infected with** *P. knowlesi*.] *Rev. Brasileira Biologia.* 1949, Mar., v. 9, No. 1, 79–85.

The English summary appended to the paper is as follows :—

"Acetylphenylhydrazine has been injected in variable doses (30 to 50 mg. per Kg. body weight) into Rhesus monkeys (*Macaca mulatta*), during different phases of *Plasmodium knowlesi* infection. Thirteen animals have been subjected to the drug, which has controlled the infection in two animals and has prolonged the time of death in four other animals. In seven animals no effect of the drug has been observed, death occurred one week after inoculation as observed in five control animals. The dosage of acetylphenylhydrazine employed is toxic for the red blood cell and a serious anemia develops in the animals studied."

REILLY, J., CHEN, G. & GEILING, E. M. K. **The Action of Drug Combinations on** *Plasmodium lophurae* **in the Chick.** *J. Infect. Dis.* 1950, Mar.–Apr., v. 86, No. 2, 105–9, 1 fig. [15 refs.]

The increase in activity of two drugs given in combination has been observed clinically in the case of quinine and plasmoquine (pamaquin) MÜHLENS [this *Bulletin*, 1927, v. 24, 265] and SINTON and BIRD [*ibid.*, 1929, v. 26, 14]. In the present study the joint effect on *Plasmodium lophurae* in chicks of combinations of drugs in pairs, including quinine, plasmoquine, quinacrine (mepacrine, atebrin) and pentaquine has been investigated and the data have been analysed in terms of equivalent doses of each drug producing a 50 per cent. suppression of parasitaemia. The method of determining antimalarial activity was that previously used by the authors [this *Bulletin*, 1950, v. 47, 326] in which cockerels of 50 to 60 gm. weight were inoculated with 50×10^6 red cells parasitized by *P. lophurae*. Starting 12 hours after inoculation a drug diet was administered for five days, and the course of infection was followed in stained films. A number of groups of eight chickens, one group serving as control, were treated with various doses of each pair of drugs singly and in combination, to include a 50 per cent. suppression of parasitaemia. When the fractional doses producing this result added up to unity the joint effect of the drugs was regarded as additive. When the sum of the fractions was greater than unity the effect was less than additive, and when less than unity a synergic effect was indicated. The earlier findings of the authors [this *Bulletin*, 1948, v. 45, 490] on the acute toxicity of combinations of the same drugs in mice correlate with the present results of treatment. These results indicate that the effect of quinine with atebrin, and atebrin with plasmoquine was additive in character, whereas that of quinine with plasmoquine and to some extent of quinine with pentaquine was synergic. *J. D. Fulton*

DÍAZ MELCHOR, F. & APARICIO GARRIDO, J. Una reacción de fijación del complemento para el diagnóstico del paludismo en la infección experimental por "Plasmodium gallinaceum". [**Complement Fixation Reaction for the Diagnosis of Malaria in Experimental Infection with** *P. gallinaceum*.] *Med. Colonial.* Madrid. 1949, Dec. 1, v. 14, No. 6, 547–53. [11 refs.] English summary (7 lines).

Details are given of the preparation of an antigen for a complement fixation test for the diagnosis of malaria infections. The red cells of a hen heavily infected with *Plasmodium gallinaceum* are haemolysed, and the deposit is washed and dried. With this antigen the complement fixation reaction was

positive in birds infected with the homologous parasite and negative in uninfected birds. For details of preparation, the original should be consulted.

Norman White

TRYPANOSOMIASIS

JACKSON, C. H. N. **Wet Season Fraying of Wings of Tsetse-Flies,** *Glossina morsitans*. *Bull. Entom. Res.* 1950, May, v. 41, Pt. 1, 159–60.

The author has studied the fraying of the hind margin of the wings of *G. morsitans*, as an indication of the age. As in previous work [this *Bulletin*, 1947, v. 44, 47 ; 1949, v. 46, 336], he allows the insects to emerge from puparia placed in an area of woodland in which this species does not normally occur : they are only allowed to emerge during a period of five days. Any flies that are captured are therefore known to have been liberated, and their age is known within that period.

Jackson finds that the rate of fraying is not significantly different in the dry and wet season (so that fraying can be used to give the mean age of a sample of flies, without correction for season). There is an indication that the brittleness of the wing increases directly with the insect's age. *P. A. Buxton*

NASH, T. A. M. & DAVEY, J. T. **The Resting Habits of** *Glossina medicorum*, *G. fusca* **and** *G. longipalpis*. *Bull. Entom. Res.* 1950, May, v. 41, Pt. 1, 153–7, 6 figs. on 2 pls.

Some species of *Glossina* (*e.g.*, *palpalis* and *morsitans*) readily come to man or bait animal. Others seem to be rare, perhaps because we do not know how to catch them.

The Olokomeji Forest Reserve in Nigeria is in a type of forest intermediate between the wet equatorial forest southwards and savannah northwards. It contains natural forest, and also plantations of teak, etc. It has been studied by entomologists on many occasions over years : a single *G. medicorum* was taken here in February, 1948, after which skilful search failed to reveal more specimens. Nash himself, with fly boys, failed to rediscover it, even with screens or a bait pig. Then in three days 20 males and 17 females were caught at rest on trunks of saplings, on which they sit head downwards, at least up to eight feet from the ground. This discovery may lead to a revision of our view that *G. medicorum* is rare, and may reveal it in places where it has never yet been detected.

In the same place *G. fusca* had previously been taken in some numbers. It has now been found resting head down on trunks of teak in plantations.

G. longipalpis is well known to occur in this place. One may miss it by walking about with screens or bait pig, but find specimens settled on leaves or on trunks of saplings. *P. A. Buxton*

BRAZZAVILLE [A. E. F.] : RAPPORT SUR LE FONCTIONNEMENT TECHNIQUE DE L'INSTITUT PASTEUR EN 1947 [CECCALDI, J., Director]. 43–58. Surveillance de la maladie du sommeil. [**Sleeping Sickness Control.**]

The section on sleeping sickness in the Annual Report of the Brazzaville Pasteur Institute for 1947 contains much detail on the clinical and pathological progress of cases treated and on the forms of treatment employed. Most of this information would not achieve the dignity of print elsewhere than in a routine annual departmental report. There are no useful summaries or generalizations,

and the more important observations, as on the use of new drugs, are no doubt repeated, or will be repeated, in other publications [see, for example, CECCALDI *et al.*, this *Bulletin*, 1950, v. 47, 18, 19, 528].

Of the 183 new cases of sleeping sickness seen at the Institute during the year, two were Europeans. It is interesting that the first indication of infection in both the Europeans was the appearance of a small area of discoloration or a boil before the onset of subjective symptoms. One of these patients was diagnosed two weeks later, but the other was not diagnosed for 10 months, by which time the cerebrospinal fluid was altered and contained trypanosomes. However, he responded well to a combined course of intravenous pentamidine and tryparsamide, though a significant follow-up period had not yet elapsed when the report was written. *E. M. Lourie*

TENDEIRO, João. Tripanosomíases animais da Guiné Portuguesa. [**Animal Trypanosomiases in Portuguese Guinea.**] Publicações do Centro de Estudos da Guiné Portuguesa No. 10. 311 pp., numerous illustrations (2 maps). [Bibliography.] 1949. Bissau.

This is No. 10 of a series of memoirs on Portuguese Guinea ; the preceding one, No. 9 [this *Bulletin*, 1949, v. 46, 530] was a general report on trypanosomiasis in all the Portuguese African colonies, but the present publication is more of the nature of a textbook on animal trypanosomiasis with special reference to Portuguese Guinea and is therefore largely a compilation. In Chapter 1 the author describes the climate, geology, vegetation, wild and domestic animals, tsetse flies and other biting flies ; Chapter 2 deals with the five species of trypanosomes of mammals in the country (*T. congolense*, *T. brucei*, *T. vivax*, *T. theileri* and *T. lewisi*) and a few other local trypanosomes, while the three remaining chapters are concerned with symptoms, methods of diagnosis and treatment. The illustrations include photographs of the local vegetation, domestic animals, and drawings of trypanosomes, and there are two maps of the territory, one of which shows the distribution of the pathogenic trypanosomes so far as is known at present [see also this *Bulletin*, 1949, v. 46, 1013]. *J. F. Corson*

WAGNER, W. H. Zur Vitalfärbung von Trypanosomen mit Acridinorange nach Strugger. [**Vital Staining of Trypanosomes with Strugger's Acridine Orange.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Sept. 23, v. 154, Nos. 6/7, 310–14. [20 refs.]

Strugger has previously shown that acridine orange (AO) was not toxic for bacteria in high concentrations. Its staining effect was said to be due to electro-adsorption to the albumins of the protoplasm, which emitted green fluorescence when alive, and red when dead. As these properties seemed suitable for determining the action of chemotherapeutic agents, the author tested the effect of AO on *Trypanosoma brucei*. Blood taken from an infected rat was first centrifuged, then the trypanosomes lying on the surface of the red-cell layer were pipetted off, washed in Ringer's solution, and suspended in the same solution with several drops of glucose. After addition of an equal volume of AO to the suspension, a drop was placed on a slide and examined microscopically.

It was found that the various structures of the trypanosomes absorbed the stain differently. While the nucleus and "Blepharoplast" [=kinetoplast] produced green fluorescence even when dead, the cytoplasm and volutin produced partly green and partly red fluorescence, according to the concentration of the stain. Therefore red fluorescence of the cytoplasm did not necessarily indicate death of the organisms, as they were still actively motile. On the other

hand, when the trypanosomes were killed with sublimate or neosalvarsan, acridine orange stained the cytoplasm and volutin green. From these observations it would seem that the type of fluorescence produced in trypanosomes by AO is not a reliable test for their vitality. *C. A. Hoare*

PACKCHANIAN, A. **Relative Immunity of the American Forest Deer Mouse, *Peromyscus leucopus noveboracensis*, against Hyperinfection and Re-inoculations with *Trypanosoma brucei*.** *Amer. J. Trop. Med.* 1950, Jan., v. 30, No. 1, 17–26. [16 refs.]

The author describes in great detail the response of American forest deer mice, *Peromyscus leucopus noveboracensis*, to experimental infection with *Trypanosoma brucei*. The infection runs a chronic course, lasting from 100 to over 600 days, the infection being slight or latent and sometimes terminating by spontaneous recovery. In some cases the presence of trypanosomes can only be proved by subinoculation of susceptible rodents, such as rats and mice. Repeated re-inoculations of the deer mouse lead to attenuation of the trypanosome strain and prolongation of the incubation period in susceptible hosts, while in some of the latter no detectable infection can be found. Infection in deer mice thus brings about a " relative active immunity " [? premunition]. Because of their inexpensiveness and the small space required for keeping them, these animals are convenient for the study of chronic infections and immunity in animals infected with pathogenic trypanosomes. *C. A. Hoare*

WERNER, H. Brandmäuse und andere Wildmausarten als geeignete Dauerträger von Trypanosomen. [**Behaviour of Trypanosomes in Wild Mice.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, May 15, v. 154, No. 1, 68–75.

This is a comparative study of the course of experimental infection with *Trypanosoma equiperdum* in various species of wild mice, carried out with the object of discovering animal hosts suitable for prolonged maintenance of this parasite. In the usual passage host, the white mouse—which in this case served as controls—the infection lasts 4–5 days. In one species of wood mice, *Apodemus agrarius*, trypanosomes first appear in the blood 2–4 days after intraperitoneal inoculation but their number remains scanty. The infection runs a chronic course, usually lasting from 75 to 190 days, and is characterized by crises and relapses, as in the guineapig. However, some individuals succumb to the infection much earlier, especially after inoculation of excessively heavy doses of trypanosomes. In field mice, *Microtus arvalis* and *M. agrestis*, the infection lasts up to 3 months. In some of the animals only a few trypanosomes could be seen while in others the infection was cryptic and could be detected only by subinoculating white mice. Other wood mice, *Apodemus sylvaticus* and *A. flavicollis*, are less suitable for observations of chronic infection, for in some cases the infection assumes an acute form of short duration, as in the white mouse. As regards the house mouse, *Mus musculus*, its susceptibility to infection with this trypanosome is as high as in its albino variety. *C. A. Hoare*

RENJIFO-SALCEDO, S. ; GROOT, H. ; URIBE-PIEDRAHITA, C. Contribución al estudio de trypanosomas humanos y de animales en Colombia. [**Study of Human and Animal Trypanosomes in Colombia.**] Reprinted from *Rev. de Higiene*. Bogota. 1949, v. 24, No. 1, 4–95, 4 figs. & 23 pls. [Numerous refs.]

Trypanosomes having been found in blood films taken from four districts of Colombia during malaria surveys, the authors decided to investigate one

of the four districts, the valley of the River Ariari, in the Intendency (province) of Meta, south-east of Bogota. Cultures of the blood of 178 persons showed trypanosomes in 63 (35·4 per cent.) ; 17 cultures were inoculated into laboratory animals and *Trypanosoma cruzi* was isolated from one of the cultures while from the 16 others a form of trypanosome similar to *T. rangeli* developed which the authors prefer not to name but to call *Trypanosoma* sp. (Ariari) pending further examination. Its similarity to *T. rangeli* was also shown in the developmental stages in laboratory-bred *Rhodnius prolixus* which fed on the blood of some of the infected persons ; similar trypanosomes were found also in *Rhodnius* caught in the infected area. The authors give a detailed account of their experiments and of the morphology of the trypanosome.

Some local mammals and birds had trypanosomes in their blood : Titi monkey (*Callicebus ornatus*) ; marmosets (*Hapale penicillata* and *H. jacchus*) ; the agouti (*Dasyprocta variegata*) ; a mouse (*Proechymis o'connelli*) ; an armadillo (*Dasypus novemcinctus*) ; a bat (*Phyllostomus hastatus* subsp.) ; the hoazin (*Opisthocomus hoazin*) ; the motmot (*Momotus momota microstephanus*) ; a toucan-like bird (*Pteroglossus* sp.). Trypanosomes were also found in *Rhodnius prolixus* and in the faeces of *Tabanus* sp., the latter resembling *T. vivax*. The illustrations include photomicrographs and drawings of the trypanosomes. *J. F. Corson*

LENT, H. O gênero "Rhodnius" Stal, 1859 (Hemiptera, Reduviidae). [**The Genus** *Rhodnius*.] *Rev. Brasileira Biologia.* 1948, Oct., v. 8, No. 3, 297–339, 47 figs. [Bibliography.]

TORREALBA, J. F., with the collaboration of F. VARADI. Otro caso agudo de Chagas. Caso 121. [**Another Acute Case of Chagas's Disease.**] *Rev. Méd. Vet. y Parasit.* Caracas. 1949, Jan.–Dec., v. 8, Nos. 1/4, 115–17, 1 fig.

BENAIM PINTO, H. & DRAYER BRITO, A. Contribución al estudio etiológico de la miocarditis crónica en Venezuela : I. Valoración de la enfermedad de Chagas como agente de cardiopatia crónica. [**Investigation into the Aetiology of Chronic Myocarditis in Venezuela. I. The Place of Chagas's Disease.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 94–134. [69 refs.] English summary.

Chronic myocarditis is common in Venezuela ; Chagas's disease is also rife. Belief is widespread that these two are aetiologically connected—that the former is caused by the latter. This belief has been too readily accepted and the authors have done [or, should we say, begun ?] an excellent piece of work in trying to find to what extent this is true ; in other words, how much of the chronic myocarditis in Venezuela is ascribable with adequate reason to infection by *T. cruzi*.

To this end they have studied the symptomatology, the electrocardiograms and the X-ray appearances of 42 cases of chronic myocarditis, one in the second decade of life, 8 in the third, 8 in the fourth, 11 in the fifth, 8 in the sixth, and 6 over the age of 60 years. Of these patients 19 died and 12 were subjected to autopsy.

Much of the evidence will be of use when added to future investigations, but have little weight when considered in relation to so few cases as 42 ; such, for example, as the States from which they come or in which they were born, and their occupations ; thus, 29 were engaged in agriculture, 7 were doing domestic work, 3 were merchants, others were engaged in a cold-storage plant. another was a butcher, another made artificial flowers (*floristero*). Some owned to having been bitten by Reduviid bugs, others denied it, but this is of

little moment ; they might not have known or they might have forgotten the fact. Xenodiagnosis gave a positive in exactly half, 21 patients.

It must be acknowledged that the study is one of great difficulty. Thus, some owned that they had had syphilis ; others who denied it gave a positive Wassermann reaction ; moreover such a reaction might be due to yaws or syphilis ; in cases of tertiary syphilis the W.R. might be negative, while, on the other hand, the cardiovascular lesions of syphilis would be difficult to separate from those of Chagas's disease and the difficulty would be further increased if the two diseases coexisted.

Nearly one-third of this paper is given up to a detailed summary of the writings of the many authors who have noted the connexion between Chagas's disease and cardiac pathological conditions. This is, of course, all as it should be and it is an excellent epitome of the views of the past 30 years.

As regards these 42 cases of the present study, 14 were definitely syphilitic, 28 were infested with *Necator americanus*, 8 with schistosomes ; some had a considerable degree of anaemia ; red cell counts ranged from 1,320,000 to 5,600,000 per cmm. and haemoglobin between 3·9 and 19 gm. per cent. Fifteen had anteriosclerosis and one had mitral stenosis ; coronary affection was not found either clinically, by electrocardiogram or at autopsy.

The fact that xenodiagnosis was positive in only half the patients is taken as meaning that syphilis, parasitic infections and anaemia may be equally responsible for the cardiac disease with *T. cruzi*. Finally, the authors come to the guarded conclusion : Of 96 patients subjected to xenodiagnosis 30 (31·2 per cent.) were positive, 42 had myocarditis and, of these, 21 were xenodiagnostically positive. That is, " 70 per cent. from xenopositive cases have myocarditis and 50 per cent. of chronic myocarditis was xenopositive." So far, therefore, it may be concluded that the myocarditis cannot in all cases be ascribed to *T. cruzi* infection and even in xenopositive cases other causes also may play a part. [An important, arresting and well-argued contribution.]

H. Harold Scott

MAZZA, S. La miocarditis chagasica desde el punto de vista anatomopatologico. [**Anatomo-Pathological Aspects of Myocarditis in Chagas's Disease.**] *Semana Méd.* 1950, Apr. 20, v. 57, No. 16, 639–40.

PAPROCKI, J. Parasitismo das válvulas cardiacas do cão pelo " Schizotrypanum cruzi." [**Infection of the Cardiac Valves of Dogs by** *Trypanosoma cruzi.*] *Rev. Brasileira Biologia.* 1949, Mar., v. 9, No. 1, 49–54, 3 figs. [17 refs.]

The English summary appended to the paper is as follows :—

" The author studied the parasitism of cardiac valves by the *Schizotrypanum cruzi* in fourteen dogs which died in the acute stage of experimental Chagas' disease. Focuses of multiplication of *S. cruzi* in the valves have been found only in three animals. The author emphasized the low incidence of this localization and the fact that the positive finding is correlated with the penetration of muscular cardiac fibers into the valvular connective tissue."

NEGHME, A., SILVA, R., VILCHES, R. & ALFARO, E. Acción del compuesto 497 sobre *Triatoma infestans* Klug 1834. [**Action of Compound 497 against** *Triatoma infestans* **Klug 1834.**] *Bol. Informaciones Parasitarias Chilenas.* 1949, July–Sept., v. 4, No. 3, 36–7.

Gammexane (benzene hexachloride) has been shown in laboratory experiments to be more effective than DDT against *Triatoma* [see this *Bulletin*, 1949, v. 46, 535]. This paper describes the use of solutions, suspensions, or

dusts of Compound 497 against *Triatoma infestans*. [Compound 497 is described as 1,2,3,4,10,10-hexachlor-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4, 5, 8-dimethanonapthelene, or $C_{12}H_8OCl_6$.] The effectiveness was measured by the number of days required to give 100 per cent. kill of the insects in cages which had been treated with insecticide. Gammexane was used as a control, but the results with its use are not shown. The residual effectiveness was estimated by repeating the tests three and a half months after treatment of the cages.

Results :—

Concentrations of Compound 497 and solvents used	Grammes of insecticide per sq. metre	No. of *Triatoma*	Days on which 100 per cent. kill observed		
			Nymphs and adults immediately after application	Nymphs only	
				1 week after application	3½ months after application
1 per cent. Xylol...	0·9	30	5	7	10
5 per cent. Kerosene	4·54	30	3–4	5	4
5 per cent. Dust ...	4·54	30	6–7	9	10
5 per cent. Xylol-Triton	4·54	30	6–7	8	7

Compound 497 appeared to be a good insecticide against *Triatoma infestans* but the authors gained the impression that it was slower in action than *gamma* benzene hexachloride. *C. M. Harrison*

PIFANO C., F., with the collaboration of M. MAYER, M. RÖMER, E. DOMÍNGUEZ, R. MEDINA & E. BENAÍM PINTO. Estado actual de las investigaciones en Venezuela sobre una nueva trypanosomiasis humana de la región neotropica producida por el *Trypanosoma rangeli*. [**Present Stage of Investigations into Human Infection by *Trypanosoma rangeli* in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 135–52, 3 figs. [11 refs.] English summary.

In 1945 the author and Dr. MAYER examined 150 specimens of *Rhodnius prolixus* and found in 46 of them a natural infection by *T. rangeli*, sometimes alone, sometimes associated with *T. cruzi*. Since then this parasite has repeatedly been found in man and to study this infection in a more thorough and detailed manner an investigation station has been established in the Yaracuy Valley, a district of 463 sq. kilometres with a population of 7,495. Some of the early results of this investigation have been reported [see this *Bulletin*, 1949, v. 46, 923].

The author now reports having stained and examined the intestinal contents of 1,637 *Rhodnius prolixus* (out of 5,000 caught) ; 320 larvae, 670 nymphs and 647 adults. Of the 320 larvae, 127 (39·6 per cent.) were infected with trypanosomes ; 39 (30·7) with *T. cruzi*, 67 (52·17) with *T. cruzi* and *T. rangeli*, and 21 (16·5) with *T. rangeli* alone ; that is, 88 (69·2) with *T. rangeli* alone or

with *T. cruzi*. Of the 670 nymphs, 256 (38·2) were infected with trypanosomes, 125 of them (48·7) with *T. cruzi*, 92 (35·9) with both *T. cruzi* and *T. rangeli*, and 39 (15·2) with *T. rangeli* alone ; that is, 131 (51·1) by *T. rangeli* alone or with *T. cruzi*. Of the 647 adults, 464 (71·7) were infected ; 290 (62·5) with *T. cruzi*, 117 (25·2) with both, and 57 (12·2) with *T. rangeli* alone ; that is, 174 (37·5) were infected with *T. rangeli*. It was seen in pyriform shapes, in long and short crithidia and, in the lower gut and rectal ampulla, as trypanosomes.

Attempts to inoculate various animals with the intestinal contents of infected *Rhodnius*—mice, white rats, guineapigs, dogs, cats, rabbits, weasels and lizards —have been unsuccessful, perhaps because the numbers of trypanosomes injected were too small.

The author and his colleagues have proved 41 human cases by xenodiagnosis in Yaracuy, 31 with *T. rangeli* only and 10 with a double infection by *T. rangeli* and *T. cruzi*. One infection may be latent for a time and a xenodiagnostic test may be positive for one only and a month or two later, or even many months, a positive result is obtained for the other trypanosome. For a diagnosis by blood examination in man several thick drops may be needed, as *T. rangeli* is scarce in the peripheral blood. Of the 31 infected with *T. rangeli* alone, 11 were under 5 years of age, 9 were between 5 and 10, 6 between 10 and 15 years ; 15 were over 20 years.

The pathogenicity of *T. rangeli* is at present uncertain, because it has so often been confused with *T. cruzi*. Natural infection of dogs occurs (see above for unsuccessful attempts to inoculate these animals). Of 38 examined, 5 harboured both trypanosomes and 6 *T. rangeli* alone, *i.e.*, 11 out of the 38 were infected with *T. rangeli*. The trypanosome is readily cultivated from citrated blood in glucose agar with defibrinated rabbit blood and Locke's solution. "Luxuriant colonies with abundant metacyclic forms have been obtained in Razgha-Reichenow's liquid medium (citrated human blood with modified Locke's solution for trypanosome cultivation). From cultures developed in that medium we have obtained the first positive inoculations in white mice. Parasitemia has been evidenced in these animals from the seventh day up to four weeks after inoculation."

More work is to be carried out to determine the prevalence of this form of trypanosomiasis in Venezuela and its epidemiology. *H. Harold Scott*

HERNANDEZ-DE-PAREDES, Cecilia & PAREDES-MANRIQUE, R. Un caso de infección humana por *T. rangeli*. [**A Case of Human Infection by** *Trypanosoma rangeli*.] *Rev. Facul. de Med.* Bogotá. 1949, Oct., v. 18, No. 4, 343–75, 20 illustrations. [10 refs.]

The patient was a man of 35 years who had lived nearly all his life at Bogotá. In November, 1947, he began to have bouts of fever, accompanied by a dry cough and copious sweats. The first febrile period lasted for 14 days and the diagnosis of exanthematic typhus was made. After a week the fever returned and for the next 65 days the rise of temperature continued with morning remissions as a rule. The liver was enlarged to two fingers' breadths below the costal margin ; pain in bones and muscles was intense and he slept little. Blood examination revealed a fall of red corpuscles to about 3 million ; agglutination of the enterica group, of *Brucella abortus* and *Proteus OX19* was always negative. He was treated successively with metoquine, plasmoquine, penicillin, streptomycin, sulphapyridine and sulphadiazine, but ineffectually.

The possibility of kala azar was next considered and chloroquine (as Aralen) was given and the temperature fell. Injection of adrenaline did not result in any parasites appearing in the blood. Blood culture in Geiman's medium was now tried and a flagellate was discovered. Nineteen days later, without any obvious cause, the patient had a shivering attack, followed by rise of temperature, loss of appetite, lumbar pain and increase in size of the liver and spleen, together with a dry cough and sweating ; this lasted for 3 weeks. In a thick drop of blood a trypanosome was seen. Chloroquine was again effectual in reducing the temperature, but not altogether. It was thought later either that the drug was merely inhibitive of the parasite or that it had not been given in sufficiently large doses.

The trypanosome was studied by culture, by xenodiagnosis and by inoculation of animals—mice, rats, dogs, monkey and horse. Finally, a woman patient with metastasis from cancer of the thyroid volunteered for inoculation. Apart from local pain from the injection she showed no symptoms, but blood culture and xenodiagnosis were positive for the flagellate. The characters, morphology and measurements are detailed and proved to be those of *T. rangeli*. Photomicrographs depict the parasite from rat-blood, from xenodiagnosis and from cultures [see this *Bulletin*, 1949, v. 46, 923].

H. Harold Scott

TORREALBA, J. F., with the collaboration of I. RAMOS & B. RICCARDI. Dos casos agudos mas de tripanosomosis rangeli, tripanosomosis de Tejera, tercera tripanosomosis humana o tripanosomosis de la region caribiana. [**Two more Acute Cases of** *Trypanosoma rangeli* **Infection.**] *Rev. Méd. Vet. y Parasit.* Caracas. 1949, Jan.–Dec., v. 8, Nos. 1/4, 111–13, 1 fig.

LEISHMANIASIS

KIRK, R. **Experimental Differentiation of** *Leishmania*. *Parasitology*. 1950, Jan., v. 40, Nos. 1/2, 58–9.

The author reviews the present position regarding the classification of the species of *Leishmania* parasitic in man and dog. He admits that they are

	L. donovani.	*L. tropica.*	*L. brasiliensis.*
Character of growth in Adler's medium	Flagellates form granular masses	Flagellates uniformly diffused	—
Effect of bile on flagellates ...	Rapid lysis	Rapid lysis	Flagellates resistant
Infection in hamsters	Visceral	Visceral	Cutaneous
Infection in spermophils ...	Visceral	Cutaneous	—
Morphology of leishmanial forms in rodents	Size uniform ($4{\cdot}2 \times 2{\cdot}8\,\mu$)	Large forms (up to $5{\cdot}6 \times 3\,\mu$) present	—
Sandfly vectors	*major* group	*sergenti* and *papatasi* groups	Neotropical species

morphologically indistinguishable, but does not agree that they necessarily belong to a single species. Although the application of bacteriological methods of diagnosis to their classification has not been satisfactory, there can be no doubt of the existence of races or strains of *Leishmania* differing in constant biological characters, including adaptation to different vectors. On the basis of such criteria the parasites can be assigned to three groups corresponding to the recognized species *L. donovani*, *L. tropica* and *L. brasiliensis* as shown in the table on p. 725.

The data in this table, which are presented as a working hypothesis, have been taken from various authorities, references to which are given in an additional column. *C. A. Hoare*

PATKAR, N. A. **Value of Row's Medium for Culture of Leishmania in Kala-Azar. A Review.** *Indian Physician.* 1949, Sept., v. 8, No. 9, 261–4, 5 figs. on pl. [14 refs.]

The author emphasizes the diagnostic importance in kala azar of detecting the presence of the parasites in material obtained by puncture of the liver, spleen and bone marrow, or in the peripheral blood. When these methods fail to reveal the Leishman-Donovan bodies, the parasites can frequently be demonstrated in cultures of material from suspected cases. The author strongly recommends Row's haemoglobinized saline medium for this purpose [see this *Bulletin*, 1931, v. 28, 155]. It is prepared as follows: a few cc. of defibrinated rabbit's blood are added to 8–10 times as much sterile distilled water; the mixture is vigorously shaken for 2–3 minutes, after which it is centrifuged, the clear haemoglobin solution is separated from the deposit and mixed with an equal volume of a double strength solution of normal saline, and then the medium is distributed in small test tubes. A trace of glucose (one drop of 25 per cent. aqueous solution per 5 cc. of medium) improves the keeping qualities of the medium, the preparation of which takes only about 20 minutes.

In the experience of the author and of Row himself, cultivation of the peripheral blood from suspected cases of kala azar at 24°C. never failed to reveal the flagellates. As an illustration of the efficacy of the cultural method, the author describes two cases from non-endemic areas of India, in whom the examination of material obtained by sternal and spleen punctures and of blood films failed to reveal any definite L.-D. bodies, but cultures in Row's medium were positive after a fortnight. *C. A. Hoare*

CHAKRAVARTY, N. K., SEN GUPTA, P. C., BOSE, J. P. & DE, U. N. **Biochemical Investigations in Kala-Azar. Part I. The Hepatic Function in Kala-Azar.** *Indian J. Med. Res.* 1949, Apr., v. 37, No. 2, 113–49, 9 graphs. [28 refs.]

A study of hepatic function in kala azar was undertaken in Calcutta in 1945. The patients were [presumably] Indians in the hospital for Tropical Diseases attached to the Calcutta School of Tropical Medicine. Six different tests for liver functions were undertaken.

Hippuric acid synthesis test: Quick's method, carried out after the intravenous administration of sodium benzoate, was used. Of 55 patients, 39 (70·9 per cent.) showed a positive reaction. If body-weight was taken into consideration, 33 out of 53 (62·3 per cent.) showed excretion below 70 per cent. of the predicted normal. In 18 cases no precipitate at all was obtained, this indicates a gross liver dysfunction. The interferences of renal dysfunction were excluded in 9 out of 10 cases tested and in the tenth the dysfunction was minimal and could not be held to account for the low hippuric acid.

Prothrombin time : In 27 of 53 there was a prolongation beyond 25 seconds—the upper normal limit for Indians and in 36 cases the prothrombin index was below 90 ; that is 67·9 per cent. showed liver dysfunction.

Plasma bilirubin : 14 out of 64 cases showed a reading above 1·0 mgm. per cent.

Serum-colloidal-gold reaction : This was done, by MacLagan's method, in 104 cases. The readings were " 5 " (complete precipitations) in sixty cases, " 4 " in sixteen, " 3 " in thirteen, " 2 " in eight, " 1 " in five and " 0 " (no change) in two : that is, 102 were positive. The quantitative test was done in several cases ; in successive dilutions from 1 in 60 to 1 in 122,880, one case showed readings of 555555554100. In two cases tested before and after treatment there was a slight reduction in the post-treatment reading. When early cases were separated, it was found that only 52·9 per cent. showed a " 5 " or " 4 " reaction compared with 73·8 per cent. of well-developed cases.

Takata-Ara Test : Crane's modification of Jezler's method was used in 107 cases. The results were strongly positive in 9, moderately positive in 32, positive in 48, doubtful in 14, and negative in 4. Again, early cases showed a lower percentage of positive results, 75 per cent. compared with 89·4 per cent. for well-developed cases.

Serum Proteins : These were estimated by the micro-Kjeldahl method. The mean total protein in 40 cases was $6{\cdot}59 \pm 1{\cdot}25$ compared with a normal of $7{\cdot}1 \pm 0{\cdot}38$ grammes per cent. In 26 cases the percentage was 7·0 or less. The albumin percentage was $2{\cdot}81 \pm 0{\cdot}88$ compared with the normal of $4{\cdot}6 \pm 0{\cdot}29$: in 37 cases it was 4·0 per cent. or less. The globulin was $3{\cdot}78 \pm 1{\cdot}20$ per cent. compared with the normal of $2{\cdot}2 \pm 0{\cdot}36$ per cent. ; in 37 cases it was 2·1 per cent. or more. The albumin : globulin ratio was 0·86 compared with the normal of 2·0, and was 1·50 or less in 37 cases.

Again, the deviations from normal were less in the early cases : for example, the albumin : globulin ratio was 0·94 for early cases compared with 0·75 for well-developed cases.

It is clear that there is considerable liver derangement affecting several of the liver functions at all stages of kala azar, and there are indications that this is more severe in the later stages of the disease. *L. E. Napier*

PIFANO C., F. La leishmaniasis tegumentaria en Venezuela. [**Cutaneous Leishmaniasis in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 170–82. English summary.

Cutaneous lesions due to *Leishmania brasiliensis* are widespread in rural districts of Venezuela and in the past they have probably, or, rather, certainly, been confused with other forms of dermatitis, yaws or blastomycosis. Typically the lesions are vegetating and at first involve exposed sites, especially the nose and lips, later the oral mucosa, pharynx and larynx. This last is a terminal stage and the mode of infection is unknown ; it may be by the blood or the lymph stream [but would not inhalation or swallowing of saliva account for it?].

The incubation period of the initial lesion, that is, the interval between the biting by the insect vector, *Phlebotomus panamensis*, and the appearance of local signs, is from 2 weeks to 3 months. It begins as a small papule which ulcerates from scratching ; this ulcer extends with small nodules (*mamelones*) of granulation tissue, attaining a diameter of 3 cm. in 2–3 months. It is painless and usually with scanty purulent secretion. Eight clinical forms are described : i. *Framboesiform* or yaws-like. 2. Like *sporotrichosis*, a vegetating ulcer on an indurated base, with thickened lymphatics and nodules along their course, which in turn ulcerate. 3. *Blastomycotic*, like the lesions of *Paracoccidioides brasiliensis*, shallow irregular ulcers of the face and oro-nasal

mucosa. 4. *Chromoblastomycotic*, vegetating, verrucous, ulcerating nodules. 5. *Epitheliomatous* with sinuous vegetating border, bleeding readily, red or greenish-yellow in colour and of foul odour. 6. *Syphiloid*, rounded ulcers of gummatous type with a layer of adherent pus, or rupia-like. 7. *Pyodermic*, like impetigo or furunculosis. 8. *Lepromatous*, nodules and infiltrated plaques, sometimes generalized but usually of face and ears.

A very graphic description is given of the repulsive later stages of the ulceration of the nostrils, nasal cartilages and lips, to produce what is called " camel nose " (nariz de camello) and the terminal involvement of the pharynx and larynx. This process is very slowly progressive, continuing for 10 or even 20 years.

Diagnosis is made by direct examination for the *Leishmania* but these are often scarce and difficult to find, or by culture in NNN medium with dextrose and Locke's solution, or by the intradermo-reaction of Montenegro, with a 0·4 per cent. suspension of *L. brasiliensis* in phenol saline as antigen. Treatment is not very satisfactory ; antimony appears to succeed in some cases, but even after apparent healing relapses are frequent and a more intensive study of the treatment is urgently needed. *H. Harold Scott*

FEVERS OF THE TYPHUS GROUP

BOYER, J. Étude épidémiologique des cas de typhus exanthématique observés dans la région parisienne au retour des prisonniers et déportés. [**Epidemiological Aspects of Epidemic Typhus seen in the Paris Region among Repatriated Prisoners of War and Deported Persons.**] *Arch. Méd. Sociale.* Paris 1946, Feb., v. 2, No. 2, 98–105.

ITOH, H., KUMANO, T., MASU, S. & SHIMADA, Y. **On the Preservation of Typhus infected Yolk Sacs and an Attempt to cultivate Typhus Rickettsiae in Dead Chick Embryos.** *Kitasato Arch. Exper. Med.* 1949, Nov., v. 22, Nos. 2/3, 125–33.

Yolk sacs infected with typhus rickettsiae were kept at temperatures of −20°C. for 120 days and were found to be still viable. Storage at the same temperature for a month, or even for two months, did not adversely affect the value of the yolk sacs for employment in the preparation of antigens.

Attempts were made to cultivate *Rickettsia prowazeki* in dead chick embryos in the manner described by RABINOWITZ *et al.* [this *Bulletin*, 1948, v. 45, 986].

The results were very unsatisfactory and the authors conclude that the procedure is very difficult even if at all possible. *John W. D. Megaw*

KRYŃSKI, S. **Forms of *Rickettsia prowazeki* Infection in Lice, artificially infected by Weigl's Method.** *Bull. Inst. Marine & Trop. Med., Med. Acad., Gdańsk, Poland.* 1949, v. 2, Nos. 3/4, 231–4.

The author describes three types of disease caused in lice by intrarectal inoculation with *Rickettsia prowazeki.*

The commonest type is an acute illness in which reddening of the body and death occur between the third and the tenth day. A few lice live as long as uninfected lice in spite of being heavily infected ; others die in less than two days, apparently of intoxication. *John W. D. Megaw*

FUKUZUMI, S., ITOH, H., YAMASHINA, A. & OHWADA, H. **On the Immunogenicity of Soluble Antigen of Epidemic Typhus Rickettsiae.** *Kitasato Arch. Exper. Med.* 1949, Nov., v. 22, Nos. 2/3, 135–42, 4 figs.

Two sets of experiments were carried out with the object of determining the relative immunizing effect of the soluble as compared with the insoluble antigens of *Rickettsia prowazeki.*

The method employed was to immunize groups of guineapigs with soluble, insoluble "specific", and whole vaccines, respectively, and afterwards to challenge the animals with living *R. prowazeki.* In one set of experiments the whole vaccine was the most potent and the specific insoluble vaccine the least potent : in the other set the specific insoluble and the soluble gave better results than the whole vaccine.

The complement-fixation titres of the vaccinated guineapigs did not show any relationship with the degree of immunity possessed by the animals.

John W. D. Megaw

MURRAY, E. S., BAEHR, G., SHWARTZMAN, G., MANDELBAUM, R. A., ROSENTHAL, N., DOANE, J. C., WEISS, L. B., COHEN, S. & SNYDER, J. C. **Brill's Disease. I. Clinical and Laboratory Diagnosis.** *J. Amer. Med. Ass.* 1950, Apr. 8, v. 142, No. 14, 1059–66, 1 fig. [Refs. in footnotes.]

In this study of Brill's disease modern methods of investigation were employed in the investigation of certain problems still awaiting a definite solution.

Fourteen patients were observed between October, 1947 and June, 1949 : all were foreign-born Jewish immigrants who had entered the U.S.A. between 1905 and 1947.

Twelve of the cases occurred during the seven-month periods, April to November. Details are given of the seven patients who were admitted between the fifth and eighth day of the illness ; from each of these rickettsiae were isolated from laboratory-reared lice which had been allowed to feed on the patients. Attempts at isolation were successful in four of the cases by inoculation of cotton rats, and in two of them by guineapig inoculation.

All attempts at isolation from the other seven patients admitted from the ninth day onwards were unsuccessful, but in every case the essential clinical and epidemiological criteria for diagnosis were satisfied. There were two deaths, one of a patient aged 38, the other of a patient aged 72.

The Weil-Felix test remained negative throughout the illness in four patients, and in seven others the titre never rose above 1–40. The authors suggest that in most cases the test is more likely to be misleading than helpful.

The complement-fixation titres were high in every case and were always higher against epidemic than murine antigen. The authors have found that the disease is not so mild as is commonly believed, though the fatality rate appears to be less than 4 per cent. The ease with which lice became infected suggested that patients living in a louse-infested community could initiate epidemics of typhus fever.

[It is, however, remarkable that there does not appear to be any record of the occurrence of attacks of typhus among contacts with the hundreds of cases of the disease which have been reported in the U.S.A.]

John W. D. Megaw

INDIAN RESEARCH FUND ASSOCIATION. REP. SCIENT. ADVISORY BOARD FOR YEAR 1948, 121–4. **Enquiry on Typhus under Dr. D. W. Soman at the Haffkine Institute, Bombay.**

——, 124–8. **Enquiry on Typhus in Bengal under Dr. K. V. Krishnan at the All-India Institute of Hygiene & Public Health, Calcutta.**

All the important matter in these reports has already been dealt with in this *Bulletin* [see specially 1949, v. 46, 719 *et seq.* in which four papers by KRISHNAN *et al.* have been reviewed].

CAMERON, I. G. **Chloromycetin and Tick Typhus.** *East African Med. J.* 1950, Mar., v. 27, No. 3, 131.

A European lady in Nairobi was found to be suffering from a typical attack of tick-bite fever of one week's duration. She was at once put on Chloromycetin, 1 gm., as a loading dose, followed by 0·25 gm. every three hours for 48 hours. Thereafter she received 0·25 gm. every three hours during the daytime : the total dose amounted to 9 gm. Response was rapid and satisfactory : the characteristic aches disappeared overnight and the initial temperature of 102·6°F. dropped to normal in 60 hours ; the rash disappeared within three days and the eschar was healing within five. The patient felt well within 24 hours : she was allowed up on the fifth day of treatment and discharged three days later.

Blood taken on the 17th day of illness agglutinated *Proteus OX19* to a titre of 1/500. The author notes that DICK and LEWIS found *Proteus OXK* agglutinins in 59 of 60 such cases [this *Bulletin*, 1948, v. 45, 328] while GEAR [*ibid.*, 1939, v. 36, 996] found a rise of both *OX2* and *OX19* but not of *OXK* titres in cases of tick bite fever.

[Striking results in the treatment of tick bite fever have also been obtained with the use of aureomycin : see this *Bulletin*, 1949, v. 46, 1025, 1137.]

H. J. O'D. Burke-Gaffney

LIEBERMEISTER, K. & ZEHENDER, E. Zur Morphologie und systematischen Stellung des Q-Fieber-Erregers. [**The Morphology and Biological Relationships of the Organisms of Q Fever.**] *Klin. Woch.* 1950, Apr. 15, v. 28, Nos. 15/16, 276–8, 3 figs. [40 refs.]

The special feature of this paper is the set of three excellent photographs of *Rickettsia burneti* taken with the electron microscope and reproduced at magnifications of 8,000 to 17,000.

Two of the photographs, taken after shadowcasting the organisms with chromium, are specially striking.

The photographs strongly support the authors' conclusions that the organisms are rightly classified as rickettsiae and that they can rightly be called *Rickettsia burneti*.

The name Q fever is considered unhappy by the authors who state that it has even been disparagingly called "*Kuh-Fieber*" [cow-fever] but they have to admit that it has the advantage of being internationally understood. No reference is made to the proposal, widely accepted in the U.S.A., to call the organism *Coxiella burneti*.

John W. D. Megaw

LUOTO, L. & HUEBNER, R. J. **Q Fever Studies in Southern California. IX. Isolation of Q Fever Organisms from Parturient Placentas of Naturally Infected Dairy Cows.** *Pub. Health Rep.* Wash. 1950, Apr. 21, v. 65, No. 16, 541–4.

The authors, working at the National Institutes of Health, Bethesda, U.S.A., have isolated *Coxiella* [*Rickettsia*] *burneti* from the placental tissues of 13 out

of 33 cows which had been found to have complement-fixing antibodies against Q fever. The method employed was guineapig inoculation ; ten of the strains were isolated at the first attempt, in the other three cases second portions of the placentas were tested.

In some cases placental tissues diluted 100 million times were found infective for guineapigs. The identification of the strains was verified by stringent tests.

It is believed that infected placentas, allowed to remain on the ground and to become desiccated, may be responsible for the spread of infection to human beings and cattle in the neighbourhood. The hides of new-born calves are also likely to be contaminated and so become a source of infection to slaughter-house and hide-plant workers. *John W. D. Megaw*

JELLISON, W. L., WELSH, H. H., ELSON, B. E. & HUEBNER, R. J. **Q Fever Studies in Southern California. XI. Recovery of** *Coxiella burnetii* **from Milk of Sheep.** *Pub. Health Rep.* Wash. 1950, Mar. 24, v. 65, No. 12, 395–9.

In South California contact of human beings with sheep has seldom been suspected of being a source of infection with Q fever.

Among 300 patients only two gave histories suggesting that sheep were responsible for causing the disease : one of these two had " watched " the unloading of a flock of sheep from railway trucks 14 days before the onset of his illness. The flock consisted of ewes, and on testing it was found that 95 out of 128 of the animals gave positive complement-fixation reactions, though only 13 of these were at titres of 1–8 (3+) or higher.

A number of pooled samples of milk from 104 of the ewes were tested by guineapig inoculation ; from one pool a strain of *Rickettsia burneti* was isolated and identified by complement-fixation and cross-immunity tests carried out on the infected guineapigs. *John W. D. Megaw*

WHITTICK, J. W. **Necropsy Findings in a Case of Q Fever in Britain.** *Brit. Med. J.* 1950, Apr. 29, 979–80, 5 figs. on pl. [13 refs.]

The outbreak of Q fever resulting from the autopsy described in this paper has already been reported [see this *Bulletin*, 1950, v. 47, 226].

The lower lobe of the right lung was in a state of red and grey consolidation resembling the condition seen in lobar pneumonia. The histological changes in the lung are described and well illustrated by eight photomicrographs. The exudate of the consolidated areas was predominantly of the mononuclear-cell type ; most of the mononuclear cells were swollen and degenerated macrophages in some of which coccoid and bacilliform rickettsiae were clearly demonstrated by Giemsa staining. The rickettsiae were intracellular and extracellular, and were also seen in macrophages of the spleen and testis, and in neuroglia cells of the brain. This is said to be the first occasion in which the rickettsiae have been seen in human tissues.

The exudate also contained a few lymphocytes and plasma cells and a considerable number of neutrophilic polymorphonuclear cells ; in certain areas red blood cells were numerous.

There were four or five small areas of softening in the brain, the largest being 0·5 cm. in diameter. A pale-brown nodule, 0·3 cm. in diameter, was found in the mediastinum of the right testis ; it consisted chiefly of large macrophages.

The report is detailed and must be consulted in the original by those interested.

John W. D. Megaw

YELLOW FEVER

See also p. 304 MATTINGLY, **Studies on West African Forest Mosquitoes. Part I.**

See also p. 498, GEIGY & GANDER, **Aeussere Einwirkungen beim Schlüpfen von *Aedes aegypti* aus dem Ei.**

ELTON, N. W. & JOHNSON, C. M. **Pathologic Features of Yellow Fever in Panama.** *U.S. Armed Forces Med. J.* 1950, May, v. 1, No. 5, 596–601, 7 figs.

The Health Departments of the Panama Republic and the Canal have carried out extensive and intensive rural vaccination against yellow fever ; nevertheless, migration of farmers into the yellow fever zone from more distant parts results in infiltration of non-immune subjects encountering the risk of infection, apart from those who deliberately refuse to submit to vaccination. Deaths from yellow fever, therefore, occur from time to time, and all organs removed at autopsy on these patients are sent to the Board of Health laboratory at the Gorgas Hospital, so that there are excellent opportunities for observing the pathological histology of this disease. The changes in the liver and kidneys are described in detail—the Rocha Lima midzonal necrosis, the Councilman bodies, the haemorrhages in the liver and, in the kidneys, the haemoglobin casts and the Hoffman bodies. The article is well illustrated and will, therefore, be of service to those less familiar with the lesions produced when they examine specimens taken by viscerotome in suspected areas. *H. Harold Scott*

DENGUE AND ALLIED FEVERS

OLIPHANT, J. W. & TIBBS, R. O. **Colorado Tick Fever. Isolation of Virus Strains by Inoculation of Suckling Mice.** *Pub. Health Rep.* Wash. 1950, Apr. 14, v. 65, No. 15, 521–2.

This study is of interest to all workers on the short fevers caused by filter-passing viruses. The authors, at the Rocky Mountain Laboratory in Montana, have succeeded in isolating the virus of the dengue-like Colorado tick fever from the blood of ten patients by intraperitoneal inoculation of albino Swiss mice, three to five days old.

The blood specimens came by ordinary mail from Colorado, Wyoming, Utah, and Oregon during the four months April to July, 1948 and 1949 ; they came from patients in the first to the tenth day of the illness.

In five cases the originally inoculated mice became ill five to eight days after inoculation and died within 48 hours. In other cases some of the mice were sacrificed on the fifth day and pooled blood suspensions were inoculated into other baby mice.

Considerable difficulty was experienced in adapting the strains to older mice, but in one case a strain was gradually adapted to 23-day-old mice by intraperitoneal and intracerebral passages.

The strains were strictly verified by neutralization tests against immune sera of hamsters which had been infected by the strain originally isolated by FLORIO *et al.* by inoculating hamsters [see this *Bulletin*, 1945, v. 42, 118]. A strain of the infection has also been isolated by KOPROWSKI and COX in 1947 by intracerebral inoculation of DBA mice [*ibid.*, 1948, v. 45, 331].

John W. D. Megaw

RABIES

BOL. OFICINA SANITARIA PANAMERICANA. 1950, Mar., v. 29, No. 3, 281–9. Algunos aspectos regionales del problema de la rabia en Estados Unidos. I. La situación de la rabia en Texas [YOUNG, K. S.] II. El problema del control de la rabia en Arizona [SUSSMAN, O.] III. La rabia en Nuevo México [DOUGHTY, J. M., Jr.] IV. La rabia en los Estados de las Montañas Rocosas [BAUM, M.D.]. [**Some Regional Aspects of the Rabies Problem in the United States.**]

SUÁREZ TORRES, G. El problema sanitario de la rabia humana en Mexico. [**Health Problems of Human Rabies in Mexico.**] *Bol. Oficina Sanitaria Panamericana.* 1950, Mar., v. 29, No. 3, 267–74, 5 graphs.

The English summary appended to the paper is as follows :—

" The present survey was made in the *Centro Antirrábico del Distrito Federal*, and comprises a period of 2 years from February 1, 1947 to January 31, 1949. Although the normal care of patients includes only the Federal District, and nearby States, the author has examined patients coming from distant points of the Republic. During the first year, 5649 persons were registered for treatment, and during the second year, 6594. Of this total, 10,574 (86·37%) were bitten by dogs, and the remaining 13·63% by other species of animals : (rodents, 1000 cases (8·17%) ; and cats, 471 (3·85%)). The sites of the lesions were as follows : head or adjacent regions, 1,626 (13·28%) ; trunk, 199 (1·65%) ; upper extremities, 4,726 (38·60%) ; lower extremities, 4,622 (37·75%) ; unspecified (contacts), 1070 (8·74). In 86·98% of the cases, vaccination started between the first and the seventh day after contact. The group which required 32,000 vaccine units represents only 4·32%. The second group who received 40,000 units represents 1·23%. Of all the cases where the therapy was completed, (33·15%), 856 (21·09%) were bitten by confirmed rabid animals ; and 1,572 (38·74%) by suspects. 82 in the group where treatment was not completed, were bitten by confirmed rabid animals, making a total of 2,510 confirmed cases. Another group of 1,630 (40·17%) suspected animals bit individuals who subsequently received full vaccine treatment, while 56 (40·58%) bit individuals who had not finished the treatment. Of 5,105 orders given for the capture of these animals, 4,617 were executed. The total of confirmed rabid-animal cases which came to the Centro Antirrábico, was 929 (20%), which is undoubtedly a high figure. Nineteen cases of human rabies were observed, 4 of which had received complete vaccination that had been initiated one to 4 days after exposure. All these were produced by dogs ; the site of the lesions may be as follows : 36·8% upper extremities ; 26·3% lower extremities, 21·1% in the face, and 15·8% unidentified."

POWELL, H. M. & CULBERTSON, C. G. **Cultivation of Fixed Rabies Virus in Embryonated Duck Eggs.** *Pub. Health Rep.* Wash. 1950, Mar. 24, v. 65, No. 12, 400–401.

Various strains of rabbit fixed rabies virus were successfully cultivated in seven-day-old embryonated duck eggs. Eggs were infected intra-amniotically and the growths were harvested after 14 days. Apart from the embryo itself, a degree of infectivity could also be detected in the extra-embryonic fluids. So far the strains have been carried for three generations and seem to have lost some of their virulence for mice (titration was done only on two mice per dilution). When used as a vaccine this material protected against 7,700 LD_{50} as determined by the mouse potency test. *C. Klimt*

REMLINGER, P. Propagation de la rage par le rat. [**Spread of Rabies by the Rat.**] *Bull. Acad. Nat. Méd.* 1950, v. 134, Nos. 9/10, 187–90.

The author draws attention to the possible rôle of the rat as a source of rabies infection. He cites one human case reported from Turkey and one from Rumania in which the patient developed rabies after rat bite. He also draws attention to the fact that dogs sometimes develop rabies even when they have never been allowed to be at large, and have had no contact with other dogs. In Chile, as well as in Spain, it is the popular belief that rats can transmit rabies. The Municipal Laboratory in Madrid has repeatedly found Negri bodies in rats. In Tangier, although rat bites have increased in recent years, no human cases of rabies developed, nor was it found possible to prove infection in rats either by microscopic examination of the brain or by transmission tests. [More evidence of the natural occurrence of rabies in rats should be adduced before these animals could be regarded as important vectors of the disease. Parallels might then be drawn with the various rodents of the meercat family incriminated as vectors in South Africa.] *C. Klimt*

BLOOD, B. D. Tratamiento antirrábico en el hombre. [**Anti-Rabies Treatment in Man.**] *Bol. Oficina Sanitaria Panamericana.* 1950, Mar., v. 29, No. 3, 293–6. English summary.

This article does not deal with actual treatment, but indicates the criteria which should guide the administration or the withholding of vaccine treatment. The doctor consulted is often faced with a difficult decision. It is easy to give the treatment to persons with wounds inflicted by an animal rabid or suspected of being rabid ; the problem is greater in the case of the " rabiphobic " patient, for the treatment is not by any means harmless and without risk, and " has probably caused more deaths than rabies itself when given to persons indirectly or remotely exposed ". About one in 3,000 suffers from neuro-paralytic accidents ; the figure may be even higher because, in the first place, inquiry is not made of all patients treated ; secondly, the paralysis is ascribed to other causes, and thirdly, the actual cause may not be recorded in the notification of death. Also, it may occur in those who have not been infected with rabies and the paralysis has been observed in animals injected with normal nervous tissue. The paralytic symptoms may, and usually do, appear suddenly, but not till after the tenth or 12th injection, and the mortality may exceed 50 per cent.

The author then enumerates the indications for the treatment : (1) When the biting animal is, in the opinion of an expert, clinically rabid, even though subsequent laboratory tests do not confirm this. (2) When typical Negri bodies are found although the animal did not show definite symptoms of rabies *ante mortem.* (3) When the animal disappears after biting. (4) When the animal has bitten without provocation and has been immediately destroyed. The importance of keeping the animal under observation and not killing it is rightly stressed.

So much from the animal aspect ; from that of the patient : (5) When there are visible wounds of the skin and one is sure or strongly suspects that they have been caused by the animal's teeth. (6) When the wounds have been produced through clothes torn by the animal's teeth. (7) When there is reason to suspect that the animal's saliva has come into contact with a fresh, though pre-existing, abrasion. (8) Lastly, when the patient is a little child who has been in direct contact with the animal, although he cannot give a definite statement of the circumstances.

If the patient has previously undergone a course of antirabic treatment great caution must be exercised in its employment and usually a shortened course of five, six, or at most ten doses, is safer.

Of contraindications, that is, reasons for withholding the treatment, the author mentions : (1) When the skin is intact and has been in contact with the animal's saliva only. (2) If the saliva has come in contact with a pre-existing wound already crusted over. (3) If the impression made by the teeth has been through clothes which have not been torn. (4) If the bite has been inflicted more than seven days prior to signs of disease in the animal. (5) If the animal remains normal for a week after inflicting the bite. (6) If the exposure was limited to handling of objects contaminated by the animal's saliva, or to caressing the animal.

The above dicta are, of course, merely indications or guides ; the vaccine, it must be remembered, is a potent defence, but used without discretion it is a weapon fraught with danger. *H. Harold Scott*

FIGUEROA, J. Problemas del control de la rabia en México. [**Rabies Control in Mexico.**] *Bol. Oficina Sanitaria Panamericana.* 1950, Mar., v. 29, No. 3, 275–80.

The English summary appended to the paper is as follows :—

"It is recognized that rabies is widespread throughout the Republic of Mexico, that animals of the canine species are the principle spreaders of the infection, and that there are large numbers of uncontrolled dogs whose owners are not held responsible for protecting them against rabies. Further, there is evidence that epizootics of rabies occur in wild animals, and that the wildlife population serves as a widespread reservoir of infection. The author recommends the adoption of uniform regulations concerning owner-responsibility and compulsory vaccination of dogs."

BOL. OFICINA SANITARIA PANAMERICANA. 1950, Mar., v. 29, No. 3, 290–92. Observaciones sobre el control de los animales predatores en la campaña antirrábica. I. El programa federal de los Estados Unidos [PRESNALL, C. C.] English summary. II. Experiencias en el Sudoeste de Estados Unidos [CATES, E. C.] III. Experiencias en Arizona [MERCER, E. M.]. [**The Control of Predatory Animals in the Anti-Rabies Campaign.**]

PLAGUE

INDIAN RESEARCH FUND ASSOCIATION. REP. SCIENT. ADVISORY BOARD FOR YEAR 1948, 88–97. **Plague.**

Most of the work described in these reports has already been published and only a few special points will be mentioned.

Sir Sahib Singh Sokhey refers to the improved growth of plague bacilli in the casein hydrolysate medium by Dubos's method of adding a "surface-active agent (tween 80)" and by maintaining a temperature of 32°C. which is high enough to prevent the formation of clumps but not too high to reduce the yield of vaccine.

Dr. P. M. Wagle produced evidence to show the special value of streptomycin in treatment ; in 32 septicaemic cases there were only three deaths as compared with five deaths among 13 cases treated with sulphamerazine, and two deaths among 11 cases treated with sulphadiazine. Although these figures are too small to be of statistical significance the clinical effect of streptomycin was

strikingly better than that of the other drugs, the temperature falling to normal much earlier—50 hours on the average as compared with 89 and 85 hours respectively with the sulphonamide drugs.

The use of DDT in villages caused a great reduction in the flea population, and one application was found adequate for the control of the fleas for at least a year.

In a plague-infected area in the Nilgiri region of south India, 278 wild rodents and 309 fleas found on them were examined and all were found free from infection so there was no evidence of the existence of sylvatic plague.

The predominant rodent was the mole-rat (*Gunomys kok*) which at times enters the houses and precincts of the villagers ; this rodent is said to be concerned in the spread of plague in the villages, the others incriminated being the house rat (*Rattus rattus*), a bandicoot (*B. malabarica*), house mice and field mice.

John W. D. Megaw

ROBERTS, J. I. **The Transmission of Plague in Kenya.** *J. Trop. Med. & Hyg.* 1950, Apr. & May, v. 53, Nos. 4 & 5, 80–87 ; 103–9.

The studies described in this paper were carried out "some years ago". Experimental transmission of plague infection by biting was carried out with all the four species of fleas common in Kenya.

Xenopsylla brasiliensis transmitted infection to *Rattus rattus*, *Mastomys coucha*, *Tatera vicina* and *Arvicanthus abyssinicus* : in one case as few as seven fleas were employed.

Ctenophthalmus cabirus transmitted infection to *A. abyssinicus* and the field rat, *Otomys* : in one case only five fleas were employed.

X. cheopis transmitted infection to *A. abyssinicus* and *Otomys* : in one case by six fleas.

Dinopsyllus lypusus infected one *R. rattus* ; 15 fleas were employed.

The author does not consider the experimental transmission by *C. cabirus* and *D. lypusus* as showing that these fleas are concerned in the natural transmission of plague in Kenya ; all the evidence points to *X. cheopis* and *X. brasiliensis* as the only fleas responsible for transmission from rat to rat and from rat to man in the region. He also concludes that *R. rattus* is the only rodent associated with outbreaks of human plague in Kenya where the disease has never occurred in the absence of mortality among these rats.

In the second part of the paper details are given of surveys of the incidence of rats and fleas in various types of houses in three urban areas. It was found that *X. cheopis* was specially associated with rats living in holes in the floors and ground, whereas *X. brasiliensis* was far more common on rats living in the roofs of the buildings.

In a fertile agricultural area of hyperendemicity of plague, more than 7,500 rats, all *R. rattus*, were trapped in the roofs of houses and grain stores ; about 18,000 *X. brasiliensis*, and only 39 *X. cheopis*, were found on the rats. The incidence of plague in the area was regarded as being less than would have been expected and it was believed that the special association of *X. cheopis* in the transmission to man was due to the specially close contact of this floor-living flea with the inhabitants. *X. brasiliensis* being specially a roof-living flea had less opportunity of biting human beings.

The author rightly calls attention to the supreme importance of depriving rats of access to food in and near human habitations ; he deplores the fact that this measure of rat control has not been adequately practised owing to the "improvidence and negligence" of the persons most concerned.

The paper contains many other points of interest to students of plague.

John W. D. Megaw

MEYER, K. F. **Immunity in Plague : a Critical Consideration of some Recent Studies.** *J. Immunology.* 1950, Mar., v. 64, No. 3, 139–63, 7 figs. [39 refs.]

This is a detailed and fully documented discussion of the nature of immunity in plague ; it has special reference to the controversial subject of prophylactic inoculation.

The author begins by reviewing at some length " the vast and somewhat unmanageable array of facts " which have emerged from the work of numerous investigators ; he concludes that phagocytosis is the most important factor concerned in the protection of man and animals against plague. The mesenchymal tissue cells are regarded as being responsible for cellular and humoral defence ; the cytoplasm of these cells in response to contact with antigens develops adaptive enzymes and thus circulating antibodies—agglutinins and specific precipitins—which remove the antiphagocytic property of the slimy envelope of the bacilli. In another place the author stresses the opsonizing effect of anti-plague sera and insists that " an almost elementary consideration of the diverse factors responsible for immunity in plague ", though this has not previously been attempted, is " nevertheless basic and essential ". *John W. D. Megaw*

FENG, Tso-hsin. **A Report of Proven Case of Primary Pneumonic Plague with Recovery and a Note on Sulfadiazine Prophylaxis in Foochow City.** *Chinese Med. J.* Shanghai. 1949, Oct., v. 67, No. 10, 547–50, 2 figs. [14 refs.]

The case of pneumonic plague described in this paper was apparently due to laboratory infection. The patient was a technician of the Fukien Provincial Health Laboratory where he was employed in the preparation of plague vaccine. No other case of plague had been known to occur in the region for more than two years.

The patient was treated with large doses of sodium sulphadiazine, given intravenously from the 3rd to the 25th day ; the total amount given was 84 gm. Sulphadiazine was also given by the mouth from the 2nd to the 20th day—80 gm. in all.

Penicillin was given on the third and fourth days, 500,000 units were given in the first 48 hours, and again it was given in daily doses of 100,000 units from the 26th to the 41st day.

Streptomycin was given by the intramuscular route from the fourth to the 14th day, and again from the 21st to the 26th day ; altogether 27 gm. were given.

Anti-plague serum was given from the fourth to the tenth day—120 cc. in all.

The temperature fell gradually, reaching normal on the eighth day, but on the 16th day there was a sharp rise and this second spell of fever lasted three days. Thereafter recovery was uninterrupted.

The author admits that the recovery cannot be attributed solely to the treatment ; the patient had received two doses of plague vaccine about a year before the attack, and his employment in preparing vaccine may have helped to produce partial immunity. [It is also possible that the virulence of the laboratory infection may not have been so great as that of a natural infection.]

The 33 persons who had been in contact with the patient before his isolation were given sulphadiazine ; 4·0 gm. on the first day, and 3·0 gm. daily for six days. The author suggests that these persons may have owed their escape from attack to the favourable action of the drug, but here again the virulence of the laboratory infection is an unknown quantity. *John W. D. Megaw*

CHOLERA

KAMAL Bey, A. M. **Lessons from the 1947 Cholera Epidemic.** *J. Egyptian Pub. Health Ass.* 1950, v. 25, No. 2, 1–10.

Short accounts are given of (*a*) the results of an examination of certain inoculation figures during the 1947 epidemic of cholera in Egypt, and (*b*) the measures taken to prevent recurrence of the disease.

The incidence and mortality of cholera was examined in relation to villages in three categories, *viz.*, (A) those in which inoculation was not commenced until five to seven days after the appearance of cases, (B) those in which inoculation was commenced 48 hours after the reporting of the first case of cholera, and (C) those in which inoculation was commenced before the appearance of the first case. The conclusion from the available records is that, to obtain any benefit, inoculation must be done in advance and before cholera obtains a footing. Villages in category C showed a lower case incidence and mortality than those in A and B, but incidence was not so low as to suggest the presence of a high degree of immunity. The author appears to think that the figures for incidence of cases in the period later than one week after the completion of inoculation in villages in all three categories, leave some doubt as to whether the lowered incidence was really due to immunization or to the waning of the epidemic curve. The main point in favour of the value of inoculation was the lowered case mortality noted. In those developing cholera later than seven days after inoculation in the villages investigated the mortality was 39·5 per cent. as compared with 57·7 per cent. in those attacked earlier. These findings refer to inoculation with a single dose of vaccine containing 8,000 million vibrios.

When the cholera epidemic in Egypt died away at the end of 1947, with only an occasional case detected during the last two weeks of January, 1948, special precautions were taken to prevent recurrence. A larger organization was created for the purpose of detecting any residual infection. Mild and inapparent cases and possible convalescent carriers were looked for. Bacteriological examinations were carried out on all cases of vomiting and diarrhoea and all deaths were investigated, rectal swabs being taken. There was also extensive bacteriological sampling of different categories of the community who might be considered to have been liable to some exposure to infection. This involved the examination of 223,189 living persons and 94,071 dead. No positive finding of *V. cholerae* was reported after 25th January, 1948, but the examinations were continued into the autumn. From 15th February, 1948, as a last precautionary measure general re-inoculation of the whole population was undertaken. Cholera did not recur. *J. Taylor*

CH'I, Ch'ang-Ts'ai & ZIA, S. H. **Further Studies of a Differential Medium for the Isolation of** *V. cholerae.* *Chinese Med. J.* Shanghai. 1949, Sept., v. 67, No. 9, 496–9.

Liquid and solid media have been devised for the differential isolation of *V. cholerae,* which take advantage of (*a*) the ability of the vibrio to grow in highly alkaline media, and (*b*) the inhibitory action of rosalic acid on Gram-positive organisms and of potassium tellurite on Gram-negative organisms. Details of the composition and methods of preparation are given. The final products contain 1 per cent. peptone, 0·8 per cent. NaCl, 0·002 per cent. potassium tellurite, and 0·005 per cent. rosalic acid at *p*H 9·2. After inoculation and incubation for 10 to 24 hours tubes of the liquid medium which show decolorization are tested for starch by the addition of Gram's iodine solution.

Those giving a negative starch reaction are further examined by the slide agglutination test with specific serum. From the solid medium, black colonies are picked off for microscopic examination and if curved rods are found slide agglutination is carried out.

As the result of experimental trials with artificially infected stools, it is claimed that very small inocula of *V. cholerae* can be detected. Other intestinal pathogens are inhibited, but occasional strains of coliform organisms may grow. Absence of decolorization and a positive starch reaction invariably indicated the absence of the vibrio in the course of the experimental trials, but simple decolorization and a negative test did not always indicate growth. It is considered that it would be advisable to use the media freshly prepared. The method is suggested for field trial. *J. Taylor*

DOORENBOS, W. & COSSERY, G. N. **Preliminary Note. R-S Variation of *V. cholerae* Korein, in presence of Anti-Phage Serum.** *J. Roy. Egyptian Med. Ass.* 1950, v. 33, No. 2, 212–15.

COSSERY, G. N. & DOORENBOS, W. **Vibrio-Phages in Drain Water.** *J. Roy. Egyptian Med. Ass.* 1950, v. 33, No. 2, 216–18.

DAWSON, C. E. & BLAGG, W. **Further Studies on the Effect of Human Saliva on the Cholera Vibrio in Vitro.** *J. Dental Res.* 1950, Apr., v. 29, No. 2, 240–54, 6 figs.

In previous studies [see this *Bulletin*, 1949, v. 46, 143] the authors had shown a bacteriostatic action of the saliva of normal healthy persons on *V. cholerae* which could not be demonstrated to the same degree in the saliva of cholera patients ; further investigations on the agent or agents in the saliva causing this effect are now reported. A special technique was adopted for the purpose. Large quantities of stimulated whole saliva from healthy subjects were collected, pooled and stored at 6°C. The pooled saliva was passed through a column of aluminium oxide activated by HCl, and the filtrate was collected in successive 20 ml. quantities which were tested for their activity on *V. cholerae*. The fractions producing full inhibition were pooled, and those showing partial or no inhibition were re-filtered. Any second filtrates which gave full inhibition were added to the first active filtrates. The complete active pool was submitted to a final filtration through the column and 20 tubes of 20 ml. were again collected. The procedure was repeated with successive lots of 400 ml. after reactivation of the column. Tests of activity against *V. cholerae* showed that the 20 successive fractions could be divided into three groups (*a*) tubes 1 to 9 inhibitory, (*b*) tubes 10 and 11 consistently non-inhibitory, and (*c*) tubes 12 to 20 fully inhibitory. The fractions (*a*) and (*c*) were designated " first active principle " and " second active principle " respectively. Tests against *V. cholerae* and eight other bacteria showed certain differences in the action of the two fractions.

Inhibitory action was tested by plating methods, and lytic action by turbidity changes as measured by the Beckman spectrophotometer.

The two principles were found to be remarkably stable. They were unaffected when kept at 6°C. for five months, and showed no change in 12 days at room temperature. They were not affected by 24 hours at 37°C. but at 75°C. showed increasing loss of activity as the temperature rose further. Inhibitory power was destroyed in 15 minutes at 100°C. Acidity at *p*H 3·1 and alkalinity at *p*H 11·3 did not alter their action. The two principles were not precipitated by a number of chemical reagents which precipitated whole saliva. They were adsorbed by activated charcoal, but not by kaolin or aluminium oxide. Tests showed them to be free from protein, urea, amylase and carbohydrase.

Lipase was present in both active principles, the first principle showing higher values. As this was the only active agent demonstrated in the filtrates an investigation was undertaken on the relationship of lipase in the saliva and body fluids of normal healthy persons to that of malnourished individuals, in whom it had been observed that cholera mainly occurs. The phospholipid content in the saliva and plasma was found to be much higher in the healthy than in the malnourished test groups. Tests for bacteriostatic and lytic action showed the filtrates from the malnourished group to have no bacteriostatic action and they produced little or no lysis in comparison with those of the test group.

The possibility is discussed that normal healthy saliva may form a first line of defence against the bacteria, and that the intestinal secretions in healthy persons may have sufficient antibacterial properties to prevent proliferation of the cholera vibrio. On the latter point further investigations would be necessary. The antibacterial effect of saliva might probably serve as an indication of the antibacterial threshold of the other body secretions.

J. Taylor

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

MACKIE, T. T., TUTTLE, R. L. & SIMPSON, T. W. **Amebiasis in Civilian Hospital and Veteran Patients in North Carolina.** *Southern Med. J.* 1950, Apr., v. 43, No. 4, 313–17. [11 refs.]

After consideration of the literature on the significance of amoebiasis, its pathology, its incidence and distribution in the United States, and its relationship to clinical dysentery, the view is accepted that *Entamœba histolytica* is always a pathogenic parasite though it does not invariably cause clinical dysentery. The importance of the so-called asymptomatic cyst-passer from the public health standpoint is thus evident.

Between January 1947 and October 1949, stools from 2,522 miscellaneous unselected patients attending the North Carolina Baptist Hospital, and from 878 ex-servicemen attending a Tropical Disease Clinic, were searched for parasites. From the first group an average of 2·1 stools was examined and 321 (12·7 per cent.) of these patients were found to be harbouring *E. histolytica* ; from the second an average of 5·2 stools was examined and 277 (31·6 per cent.) were found to harbour the parasite. The second group was under better control, and during the study the examination of a minimum of three specimens passed in the laboratory after an early morning dosage with one ounce of magnesium sulphate was adopted in order to reduce the patients' attendances to one day. The search was solely for pathogenic parasites ; the method was direct microscopy of saline and of iodine emulsions both before and after zinc sulphate concentration ; later on, iron-haematoxylin-stained preparations were also studied. It was considered that examination of the second, third and fourth stools passed after purgation revealed all cases of infection with *E. histolytica* ; examination of the second stool, alone, revealed 78 per cent. of these ; and examination of the second and third specimens, alone, brought to light 90 per cent. of them ; after experience, the first stool was not examined as it revealed only about 30 per cent. of the cases of infection. While frank dysentery was unusual in these patients, a wide range of minor symptomatology from which they suffered was thought to be due to their *E. histolytica* infections.

A. R. D. Adams

PHILLIPS, B. P. & REES, C. W. **The Growth of *Endamoeba histolytica* with Live and Heat-Treated *Trypanosoma cruzi*.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 185–91, 3 figs.

In a previous paper [this *Bulletin*, 1950, v. 47, 624] one of the authors described a successful method of cultivation of *Entamoeba histolytica* with live and killed *Trypanosoma cruzi* as the only other accompanying organism. Since then bacteria-free cultures of the amoeba have been maintained in 50 subcultures with living trypanosomes and in 25 subcultures with trypanosomes heated at 48°C. for ten minutes. The cultures were in both cases kept in test-tubes, but, for the study of growth rates of the amoebae under the influence of slight changes in the medium, cultures in microtubes were used. The data obtained in this manner are presented in tabular form. The bacteria-free cultures are being used in the production of *histolytica*-antigen for serological tests, for inoculation of experimental animals with the amoeba, for the study of its physiology, and for chemotherapeutic purposes. Although the presence of trypanosomes introduces foreign factors in place of those present in bacterial associations, the chief advantage of this method lies in the ease with which the trypanosomes are inactivated at lower temperatures than those required for bacteria. *C. A. Hoare*

THOMPSON, P. E., DUNN, Mary C., BAYLES, Anita & REINERTSON, J. W. **Action of Chloramphenicol (Chloromycetin) and other Drugs against *Endamoeba histolytica in vitro* and in Experimental Animals.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 203–15, 1 fig. [15 refs.]

Data are presented on the results of *in vitro* tests with chloramphenicol [chloromycetin] and other drugs against *Entamoeba histolytica*, accompanied by a mixed bacterial flora, and in experimental infections of rats and dogs with this organism. In the former test a diphasic as well as a wholly liquid medium was used after adjustment of *p*H between 6·5 and 7·5, and 150,000 amoebae were added to each tube in 0·5 cc. suspension. The culture tubes were incubated for 24 hours at 37°C. aerobically and in an atmosphere of CO_2 (anaerobically) in presence of the drugs under test. It has recently been indicated by the work of BRADIN & HANSEN [this *Bulletin*, 1950, v. 47, 538] that a greater concentration of some antibiotics is required to produce anaerobically the same effect against *E. histolytica* as under aerobic conditions. The method of JONES [this *Bulletin*, 1947, v. 44, 313] was used to evaluate the activity of drugs administered in diet to rats infected by the intracaecal route. The animals were killed seven days after infection and the caecal contents were examined, as well as the condition of the gut wall, in order that a decision might be arrived at regarding the potency of the substance under test. In the case of dogs the methods used were those of THOMPSON & LILLIGREN [this *Bulletin*, 1949, v. 46, 1036]. The drugs were given in gelatin capsules and faecal material obtained by colonic irrigation was examined microscopically for amoebae, thrice-weekly for four weeks. The results indicated that chloramphenicol was effective *in vitro*, less so in the diphasic than in the liquid medium [the fallacy of using the former was pointed out in the case of emetine by LAIDLAW *et al.* (this *Bulletin*, 1929, v. 26, 469)]. Chloramphenicol was active against the rat infection and to a lesser degree against that in dogs. As previously found by JONES [*loc. cit.*] penicillin was very effective in the treatment of rats, but was less active in the other tests. The results with a few well-known antibiotics were not promising. Those obtained with accepted amoebicides were in agreement with the findings of other authors. *J. D. Fulton*

BONNIN, H., MORETTI, G. F. & GUIGNARD, J. Comportement des amibes vis-à-vis du chlorhydrate de conessine. [**The Response of Amoebae to Conessine.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 37–8.

[Though the name of the amoebae used in this work is not mentioned at all in the paper, it is obvious from the context that the authors were dealing with *Entamoeba histolytica*.] It is known that conessine inhibits the development of the amoebae in culture at a dilution of 1 : 25,000, but in view of possible alterations of the drug in the presence of the complex components of the culture media, the authors have studied its effect on the amoebae by direct microscopic observation. A drop of conessine of known concentration was placed on a slide and a drop of a three-day culture of amoebae was added to it, after which a coverslip was applied and sealed with paraffin wax and the preparation was examined in Foot's warm chamber at 37°C. It was found that in concentrations of 1 : 1,000 and 1 : 2,000 the movements of the amoebae slow down, then they become stationary and assume a spherical form, while the cytoplasm and starch granules collect in the middle of the body, leaving a clear peripheral zone. This effect is produced in dilutions of conessine up to 1 : 4,000 after contact for 2½ hours. *C. A. Hoare*

BONNIN, H., MORETTI, G. F. & GUIGNARD, J. Recherche d'un taux maximum de dilution de la conessine inhibant les cultures d'*Entamoeba dysenteriae* et comparaison avec l'émétine. [**Maximum Dilution of Conessine Inhibiting Cultures of *E. histolytica* : Comparison with Emetine.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 39–41.

The authors describe tests on the *in vitro* effect of conessine on *Entamoeba histolytica*, in which they used cultures in Dobell-Laidlaw's medium containing various concentrations of the drug and examined them daily until the amoebae were dead. The maximum dilution of conessine at which the growth of amoebae is inhibited was found to be 1 : 25,000 when the drug was allowed to act for two to five days. When it was added to a flourishing three-day culture, the delay in inhibition of growth was reduced by two days. Under the influence of conessine the amoebae first lose the starch inclusions, then the endoplasm becomes granular, and they gradually become immobilized. Parallel tests with emetine hydrochloride showed that this drug inhibited the development of the amoebae in cultures in a dilution of 1 : 100,000. *C. A. Hoare*

BONNIN, H., MORETTI, G. F. & GUIGNARD, J. Action du sérum de malade traité par la conessine et du sérum humain normal, sur le développement des cultures d'*Entamoeba dysenteriae*. [**Effect of Human Sera from a Patient treated with Conessine and from a Normal Person on Cultures of *E. histolytica*.**] *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 41–3.

Since the elimination of conessine given by mouth appears to be very slow, it is thought that it is absorbed in the intestine, whence it finds its way into the blood. The experiments reported in this paper were undertaken to test the action upon cultures of *Entamoeba histolytica* of human serum from patients treated with conessine and from normal subjects. The serum was added to the liquid overlay of the medium in concentrations from 10 to 50 per cent. The results were as follows : (1) Serum taken from a patient on the fifth day of treatment with conessine (0·5 gm. per diem) had a marked inhibitory action on the growth of the amoebae in dilutions from 10 to 30 per cent. ; they were scanty during the first three days, after which they disappeared. In dilutions of 40 to 50 per cent. the cultures remained negative. (2) On the

contrary, normal human serum (especially in dilutions of 30 to 40 per cent.) had a favourable effect on the development of the amoebae which were much more numerous than in the presence of horse serum. (3) Normal human serum to which was added a concentration of conessine equivalent to 2·5 gm. per 60 kgm. of body weight had a slighter effect upon the amoebae than the serum of a patient treated with that drug (1). *C. A. Hoare*

LAIRD, R. L., DRINNON, V. P. & DAVIS, A. B. **Routine Culture Methods in diagnosing** *Endamoeba histolytica*. *J. National Malaria Soc.* 1949, Sept., v. 8, No. 3, 198–201.

The authors complain that the clinical laboratory diagnosis of amoebiasis is " in a chaotic condition ", which they attribute partly to the lack of trained technicians and partly to reluctance to employ new methods. Among these is the cultural method, regarding the practical importance of which opinions are divided. The authors have put this question to the test in a comparative study of four culture methods and the haematoxylin stain method. For this purpose fresh stool specimens, containing cysts or trophozoites of *Entamoeba histolytica*, were used immediately to make smears, which were fixed in Schaudinn's fluid and stained with Heidenhain's iron haematoxylin ; after which samples were examined in saline and iodine, and portions were inoculated in some or all of the following culture media : (*a*) Nelson's egg yolk alcoholic extract, (*b*) St. John's beef heart extract, (*c*) Balamuth's special (Difco laboratories) and (*d*) egg slant overlayed with buffered saline. The material consisted of 350 stool specimens, from 145 patients, on an average 2·4 specimens from each. Of these 26 were found to be positive for *E. histolytica* by Nelson's cultural and stain methods combined, while culture alone revealed 25, and the stain 20. Of the cultural methods, Nelson's revealed the greatest number of infections and also proved to be superior to the stain method used alone, but a combination of the two increased the number of positive results. Nelson's medium was found to be also suitable for the maintenance of strains of *E. histolytica*, with subinoculations every four to five days or at longer intervals. In view of these results the authors recommend the employment of the culture method (in Nelson's medium) as a routine procedure in the laboratory diagnosis of amoebiasis. *C. A. Hoare*

SCARLINI, F. Il valore pratico della ricerca culturale su terreni nutritivi nella diagnosi di amebiasi. [**The Value of Cultural Examination in the Diagnosis of Amoebiasis.**] *Acta Med. Italica.* 1950, Mar., v. 5, No. 3, 57–65. [57 refs.] English summary.

Although this study must have been somewhat laborious the results can be summed up quite briefly. The first half of the paper is taken up with an account of the methods of cultivation of *E. histolytica* and the results which have been recorded from time to time. The author then proceeds to report the results in 50 cases of amoebic dysentery in which direct examination of the stools and cultivation on Boeck and Drbohlav's medium and on that of Dobell and Laidlaw were compared. Of the 50, 13 showed the amoeba on direct examination, ten showed growth on the BD medium and nine (two others doubtful) on the DL medium. In another Table the author gives the results of 40 specimens ; nine were positive by direct examination and of these nine five were positive on the BD medium and six on the DL medium, whereas of the 31 negative by direct examination four were positive on BD and six on DL ; in other words, nine altogether were positive by direct examination, nine by culture on BD and 12 on DL media.

The author concludes that the cultural results are not altogether reliable (in four of the cultures an amoeba was present but could not be identified) and, though a helpful adjunct, cultivation cannot be regarded as a reliable substitute for direct examination. *H. Harold Scott*

LABAIL, G. Deux cas de perforation du sigmoide chez des amibiens. [**Two Cases of Perforation of the Sigmoid in Patients with Amoebiasis.**] *Bull. Méd. de l'Afrique Occidentale Française.* 1949, v. 6, No. 1, 83–7.

The risk of perforation of the bowel during sigmoidoscopy in patients suffering from amoebiasis should always be in the operator's mind. In acute cases the ulcers may extend deeply through the muscular coats, leaving the floor consisting only of peritoneum protected by a few easily torn adhesions. In chronic cases with active ulceration, scarring, thickening and rigidity of the intestinal walls with narrowing of the lumen may render the introduction of the sigmoidoscope difficult. Apart from the pathological condition which may be present, a long mobile sigmoid loop, with a long mesentery, may form a sharp angle at the recto-sigmoid junction, opposing the further passage of the instrument which, if pushed on, presses the intestinal wall in front of it, injuring the tissues and possibly leading to perforation of an ulcer.

Two cases are quoted in which this appeared to have happened. The first was an acute case in a patient aged 35, with frequent stools in which *Entamoeba histolytica* was found; sigmoidoscopy showed ulceration at 10–15 cm. from the anus, but none at 25 cm., to which point the instrument was passed with considerable difficulty. Symptoms of culminating general peritonitis set in during the night and the patient died next day; at autopsy a perforated ulcer was found in the sigmoid, 20 cm. from the anus. It is possible that the perforation in this case was spontaneous, but more probable that it was due to the sigmoidoscope. The second case was that of a man aged 40 with a history of chronic relapsing dysentery of 18 months' duration. Rectoscopy was done twice without incident, ulcers, from which *E. histolytica* was recovered, being found at about 12–15 cm. from the anus, beyond which the instrument could not be passed. The third sigmoidoscopy was performed one month from the start of treatment, when the patient's condition had much improved and on this occasion the instrument was passed up 25 cm.; sharp pain and some rectal bleeding followed and during the night symptoms of general peritonitis set in. Laparotomy was performed 16 hours after the sigmoidoscopy, a small perforation whose margins were not necrotic was found in the sigmoid and was sutured. Recovery was uneventful. There was no doubt in the author's mind that the perforation in this case was caused by the sigmoidoscope.

W. L. Harnett

SLUTZKY, Z. Relaciones entre la ulcera duodenal y la amebiasis intestinal. [**Connexion between Duodenal Ulcer and Intestinal Amoebiasis.**] *Semana Méd.* 1950, Apr. 6, v. 57, No. 14, 546–9.

The author describes the case of a man of 56 years who for some six years had suffered from pain coming on 1–1½ hours after meals; at first he disregarded this as the trouble would for a time clear up spontaneously. Later the pain increased and he consulted a doctor who diagnosed a duodenal ulcer which was confirmed by X-rays. Treatment on the usual lines not proving satisfactory, the patient consulted the author who found *E. histolytica* both vegetative and cystic forms, in the stools. He was given emetine and the symptoms cleared up and the stools no longer showed amoebae. The author found that among 66 patients with duodenal ulcer 11 had also intestinal amoebiasis and he asks

the question : Is this merely accidental association or are they aetiologically connected ? He maintains that the presence of *E. histolytica* in the duodenal fluid is "frequent and quite logical, because its alkaline reaction favours development and multiplication of the parasite." Hence, if a patient presents himself with this combination, emetine should be given first ; this may forestall any surgical procedure and he concludes [rather, it would seem, a *petitio principii*] that *E. histolytica* can cause ulceration not only in its usual situation but in the duodenum also with symptoms of duodenal ulcer. *H. Harold Scott*

GUTIÉRREZ P., A. Un tipo obstructivo agudo de amibiasis intestinal. [**An Acute Obstructive Form of Intestinal Amoebiasis.**] *Rev. Facul. de Med.* Bogota. 1950, Feb., v. 18, No. 8, 541–3.

Two cases, with recovery after emetine and arsenic.

PEAKE, J. D. & ESKRIDGE, M. **Hepatic Amebiasis with Complications.** *Southern Med. J.* 1950, Apr., v. 43, No. 4, 300–306, 3 figs.

The purpose of this paper is to stress the frequency of liver involvement in those infected with *Endamoeba histolytica*. In the United States probably 10 to 30 million people harbour this parasite and of these one million suffer hepatic invasion with it, though this does not necessarily progress to frank abscess formation. Full radiographic examination should reveal between 80 and 90 per cent. of those with amoebic involvement of the liver, though the diagnosis solely on the history and on clinical examination is often difficult and confusing unless amoebae are discovered after demonstration of an abscess cavity surgically. The stools yield *E. histolytica* in probably only 15 to 70 per cent. of cases of hepatic amoebiasis. Details of seven illustrative cases [two fatal] are cited, and the importance is emphasized of early diagnosis and treatment of hepatic amoebiasis to avoid complications and mortality. Once suppuration is allowed to take place the mortality becomes high. A diagnosis of early amoebiasis of the liver is thus justified on positive X-ray findings in association with a typical clinical course, in spite of negative stool examinattons. *A. R. D. Adams*

SCOTTI, G. & TRIPODI, P. Emetina, penicillina, epatocentesi nel trattamento dell'epatite amebica colliquativa. [Contributo clinico]. [**Emetine, Penicillin and Hepatocentesis in the Treatment of Amoebic Liver Abscess.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Jan., v. 31, No. 1, 24–30. [26 refs.]

The English summary appended to the paper is as follows :—

"Description is given of a case of a large amoebic abscess in a patient who contracted amoebic dysentery in Africa, the diagnosis of which was microscopically confirmed.

"The patient had undergone emetine treatment 16 times in 13 years by intramuscular injection which did, however, not prevent him from developing hepatitis, treated, on its clinical appearance, with a further two series of emetine injections which proved again unsuccessful. Twelve million units penicillin had no better result. The disease was cured by repeated puncture of the abscess and the direct introduction of penicillin and emetine into the abscess itself."

CHARTERS, A. D. **Toxic Action of Emetine on the Cardiovascular System.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 513–22. [22 refs.]

Ten Africans and one Sikh, all military patients, were observed during and after a 12-day course of emetine treatment (1 grain daily, intramuscularly) to

determine the effect of the drug on the cardiovascular system. Nine of the patients suffered from amoebiasis, and two from schistosomiasis with post-arsenical jaundice. Tests were made for interference with venous return, for changes in the circulation rate and blood pressure, for cardiac dilatation, for variations in the resting pulse rate, for exercise tolerance, and for alterations in the electrocardiographic recordings. Nine of the patients continued under observation for over one month after treatment. There was an average fall of 8 mm. in the systolic and 4 mm. in the diastolic pressures at the completion of treatment ; exercise tolerance was diminished in seven of nine cases, but it rapidly returned to normal in five after the treatment ; the electrocardiographic recordings underwent some changes in six cases, but in three patients with abnormal tracings before treatment these were restored to normal during the treatment.

Two Africans accidentally overtreated with emetine were seen by the author in 1943. One had 20 grains of emetine over a period of 20 days, and the other 32 grains in 32 days. In neither case did permanent evidence of the overdosage result, though in each there were some changes in the electrocardiographic recordings both during and for a short period after the treatment. Reference is also made to a European who had an average of 20 grains of emetine by injection annually for four years without ill-effect.

After referring to the literature on the subject the author considers that emetine in accepted therapeutic dosage in his cases caused only slight deterioration in cardiovascular function, but in view of the cumulative effect of emetine demonstrated by other workers, intervals of two or three months should be allowed to elapse before emetine treatment is repeated.

[Under the conditions obtaining in certain areas during the recent war repeated emetine treatment was not uncommonly given at short intervals ; some patients received over 300 grains of emetine by injection within a period of two years, without apparent permanent ill-effect.] *A. R. D. Adams*

ZUIDEMA, P. J. **Emetine Intoxication.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 36–40, 1 fig.

"An Indonesian patient, aged 52, suffered severe myocardial damage after nine subcutaneous injections, each of 60 mg. emetine (corresponding to 7 mg. emetine per kg. bodyweight). The pulse rate suddenly rose to 126. The ECG revealed a lowered ST segment in lead I and II, a negative T in lead II and III, and a flat T in lead I. No other signs of intoxication were observed.

" Notwithstanding absolute rest in bed, it was three weeks before the pulse was reduced to its original rate. Another ECG taken two weeks after the first, showed that the abnormalities had largely disappeared.

" The patient probably had a high individual susceptibility to the drug, as is also suggested by his history : in 1918 there developed a complete paralysis of the extremities after seven injections of emetine (dosage unknown), necessitating a stay in hospital for several weeks.

" Cardiac damage was eventually the only clinical evidence of intoxication. Organic heart disease probably existed before emetine treatment was initiated."

MCVAY, L. V., Jr., LAIRD, R. L. & SPRUNT, D. H. **The Treatment of Amebiasis with Aureomycin.** *Southern Med. J.* 1950, Apr., v. 43, No. 4, 308–13, 2 figs.

Previously [this *Bulletin*, 1949, v. 46, 1044] these same authors have recorded the successful preliminary use of aureomycin in the treatment of intestinal

amoebiasis. Now, after reviewing the drugs currently employed in the therapy of amoebiasis and the uncertainties and ill-effects attending their employment, they direct attention to the importance of precision in diagnosis before treatment of this infection is undertaken and deplore the indiscriminate use of anti-amoebic agents before the diagnosis is established. After thorough investigation, 37 cases of proven amoebiasis (29 suffering from symptomatic amoebic colitis ; two from asymptomatic amoebic colitis ; two from amoebic dysentery with hepatitis ; three from complicated amoebic colitis with hepatitis ; and one from an amoebic abscess of the liver) were treated with aureomycin and were observed for one to six months subsequently. Among these patients were eight children and one pregnant woman ; in addition to *Entamoeba histolytica*, other intestinal protozoal parasites were found in most of them. Multiple cases of infection with *E. histolytica* in a family were found in seven of 14 families investigated ; this indicates the highly infectious nature of amoebiasis.

The amount of aureomycin given to a first group of four patients ranged from 18 to 22¾ grammes in divided doses over five or six days ; to a second group of 23 patients, 14 grammes were given over seven days ; and to a third group of 16, 7 grammes were given over seven days. The side-effects of treatment were trivial ; in five patients they took the form of mild nausea, in five marked nausea and vomiting, in six mild diarrhoea, in six a metallic taste, in three a " fluttery " sensation in the epigastrium, in three mild pruritus ani, and in one vertigo. Four patients suffered from a feeling of anxiety. Bed rest and limitation of activity markedly lessen these side-effects. In the case of every patient in each treatment-group *E. histolytica* had vanished from the stools immediately after treatment. All four patients in the first group were cured of this infection, as judged by re-examinations of two to five stools periodically for six months ; in the case of four patients in the second group, these parasites had reappeared in the stools one to two months after treatment, and so these four were given additional treatment ; six of the patients of the third group were found still to be passing these parasites in their stools one month after treatment, and these were re-treated among the group 2 cases—it was four of these cases apparently transferred from the third group for re-treatment which again failed to become sterilized by the second group treatment. The authors are of the opinion that in at least two of these apparent failures to sterilize in the second group of cases, reinfection rather than failure to cure was the correct explanation for the reappearance of parasites in the stools after one month ; these two patients, a husband and wife, were living under squalid insanitary conditions. The dosage of aureomycin the authors now advocate is 500 mgm. orally four times daily for one week.

It was observed that of the associated protozoal infestations *Entamoeba coli*, *Endolimax nana*, and *Iodamoeba bütschlii* disappeared from the stools after aureomycin treatment, but the flagellates (*Chilomastix*, *Trichomonas hominis*, and *Giardia intestinalis*) did not do so. The value of aureomycin in the treatment of amoebic liver abscess has not yet been determined. Details of three cases are given to illustrate the response to aureomycin therapy ; one of these had an amoebic granuloma in the splenic flexure, which was resected and a splenectomy was done.

The mode of action of aureomycin is discussed and it is probable that it exerts (1) a direct action on the amoebae in the intestine, (2) an action on these amoebae by alteration of the intestinal flora, (3) " an action mediated by the vascular system," or (4) a combination of two more of these actions. The matter is receiving further attention.

[The authors rightly point out the importance of accurate diagnosis before treating amoebiasis, but it seems to the reviewer that they examined insufficient numbers of stools after treatment accurately to assess its sterilizing action.

Although in every case treated with aureomycin parasites had vanished from the stools on completion of the treatment, this is not unusual after other forms of treatment. In several instances the real claim to cure in this series substantially rests on re-examination of a total of only 2 or 3 stools between one and six months after treatment ; in but few cases does this total exceed 10. The extreme importance of an accurate assessment is obvious when a new drug of promise, such as this, is first tried.] *A. R. D. Adams*

HUGHES, J. D. **Treatment of Amebiasis with Aureomycin. Report of Thirty-Eight Cases.** *J. Amer. Med. Ass.* 1950, Apr. 8, v. 142, No. 14, 1052–4.

Thirty-eight patients suffering from persistent symptoms of active amoebiasis with positive stools were treated with aureomycin ; almost all of them had previously been treated with carbarsone and diodoquin, and some of them with vioform or emetine hydrochloride and chiniofon. These cases, of which details of three are cited as illustrations, may be taken as being more difficult to cure than are mild previously-untreated cases, and therefore constituted a severe test of aureomycin treatment. Each patient was ambulant during the treatment, which consisted of 28 capsules (each containing 0·25 gm. of aureomycin) over a period of 4 to 7 days. The nausea commonly induced by the drug was treated palliatively ; abdominal cramps were relieved by paregoric ; rectal and perianal burning sensations commonly were experienced. Two weeks after treatment was completed, 5 warm liquid stools were obtained by saline purgation and examined for parasites ; if none was found and the patient was free of symptoms he was pronounced "cured." The author recognizes the fallibility of conclusions based on such limited examinations, but by this criterion, of the 38 patients treated 27 were considered cured and the remaining 11 were not cured. In many of those regarded as cured subsequent stool examinations [number unspecified] at intervals of 2 or 3 months failed to yield parasites. It was remarked that almost all the patients, even those not cured, rapidly felt much better for the treatment.

A. R. D. Adams

JONES, W. R. **Antibiotics in the Treatment of Amoebiasis.** [Correspondence.] *Nature.* 1950, Apr. 22, 649–50.

Recent work by McVAY *et al.* [this *Bulletin*, 1949, v. 46, 1044] has shown that aureomycin may be of value in the treatment of amoebiasis and furthermore those authors claim that this treatment results in disappearance of the parasite. Hitherto, penicillin appears to be the only one of the three antibiotics penicillin, streptomycin and chloromycetin which has been used in human amoebiasis and experience has been that its effect was primarily an action on secondary bacterial infection : *Entamoeba histolytica* persisted and required formal treatment with amoebicidal drugs for its eradication.

The present author in experimental amoebiasis in rats [this *Bulletin*, 1947, v. 44, 313] has demonstrated a significant therapeutic effect of aureomycin at doses of 5–10 mgm./kgm. Penicillin and streptomycin produced this effect at doses of 6·25 mgm./kgm. and 2 mgm./kgm. respectively, while chloromycetin had no effect until the comparatively high dose of 100 mgm./kgm. was used.

The claim of McVAY *et al.* now suggests that aureomycin has some direct lethal action on the amoebae : such an action of drugs on *E. histolytica* is difficult to investigate because the parasite cannot yet be cultivated free from bacteria. At concentrations down to 1/90,000 aureomycin prevents growth of a strain of *E. histolytica* in simple liquid medium in the presence of a single species of *Bact. coli*. With another strain, associated with complex bacterial

flora, the minimal inhibitory concentration was 1/30,000. Chloromycetin behaves in exactly the same manner, but penicillin and streptomycin are much less active against the strain carrying the complex bacterial flora than against that carrying only *Bact. coli* (minimal effective concentrations were 1/1000 against the former strain and 1/270,000 against the latter).

The question arises whether certain organisms may under natural conditions produce substances inhibitory to *E. histolytica*. STEWART *et al.* [this *Bulletin* 1948, v. 45, 788] showed that under certain conditions an enterococcus can inhibit the growth of the amoeba by production of lactic acid and SINGH (*Brit. J. Exper. Path.* 1945, v. 26, 316) showed that certain bacterial pigments are toxic to soil protozoa. The author suggests that the intestinal flora or fauna may be a source of some specific anti-amoebic agent.

H. J. O'D. Burke-Gaffney

ANDERSON, H. H. & ANDERSON, Jeanette Van D. **Antibiotics against Amebiasis in Macaques.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 193–201. [16 refs.]

The authors have investigated the activity of the following antibiotics—actidione, aerosporin, antibiotic "S", NA7M10, aureomycin, bacitracin, lupulon, penicillin G and O, streptomycin and subtilin—against *E. histolytica* accompanied by organism "t" *in vitro*, by the method of BRADIN & HANSEN [this *Bulletin*, 1950, v. 47, 538]. Tests were also made, the penicillins excepted, with the same substances against *E. histolytica* infections in thirty-one macaques. Investigations on liver and kidney function, haemoglobin levels, red and white cell counts and electrocardiograph tracings before and after treatment were also made in these animals. Maximum doses of each substance were given orally except in the case of NA7M10 which was administered subcutaneously. A combination of bacitracin, aerosporin and streptomycin was used in both methods of tests to find if synergic effects were present. The *in vitro* results indicated that only substance "S" and possibly NA7M10 were acting directly against the amoebae as opposed to acting indirectly against the accompanying bacterium.

Aureomycin has been shown to be absorbed systemically but some of the others appeared to exert their effect by direct contact and thus would be of little value as amoebicides in tissue infections. Aureomycin and NA7M10 in toxic doses caused the disappearance of amoebae for periods up to 25 days. The combination of the three drugs mentioned exerted a temporary beneficial effect. Some of the other substances gave rise to pathological lesions and their value in treatment of amoebiasis is doubtful.

J. D. Fulton

SWARTZWELDER, J. C. & MULLER, G. R. **A Comparison of the Infection Rate and Gross Pathology of Amebic Infection in Normal and Antigen-Injected Rats.** *Amer. J. Trop. Med.* 1950, Mar., v. 30, No. 2, 181–3.

In order to test the effect of immunization upon the resistance to infection and pathological changes when exposed to *Entamoeba histolytica*, young rats were injected subcutaneously on the 5th, 10th and 15th days of age with increasing doses of entamoebic antigen, up to a total of 0·5 cc. The antigen represented an aqueous extract of lysed amoebae grown in culture. The rats were inoculated intracaecally with a canine strain of *E. histolytica* between the 5th and 7th days after immunization, while litter mates were used as controls. The animals of both groups were sacrificed four days later, when the caecum was examined for lesions and for the presence of amoebae. The results indicated that previous injection of amoebic antigen had a definite influence in

reducing the rate and degree of infection in rats. Thus, of the 90 antigen-treated and 83 control rats 37 per cent. of the former and only 8 per cent. of the latter did not develop amoebic lesions. The infection rates and average degree of infection were also higher in the controls than in the immunized animals.

C. A. Hoare

ALBORNOZ PLATA, A. Tratamiento de la giardiasis por el clorhidrato de cloroguanida. [**Treatment of Giardiasis by Chlorguanide Hydrochloride.**] *Prensa Méd. Argentina.* 1950, Feb. 17, v. 37, No. 7, 311–13.

The author has treated several cases of giardiasis with chlorguanide [paludrine, proguanil], with unqualified success. Chlorguanide is a stable drug, soluble in water, not decomposed by boiling, and is excreted in the urine and faeces, acting on the parasite *en passant.* He reports here on 12 adults and 8 children, the ages ranging between one and 32 years. One tablet of 0·25 cgm. [this presumably means 0·25 gm.] was given daily to adults for 8 days ; for children the dosage was 0·02 cgm. [presumably 0·02 gm.] for each year of age up to 6 years, also for 8 days. After the course, faecal examination was negative in all. None showed any signs of intolerance and no complaint was made, even by the children, and it had no adverse effect if the patient happened to be pregnant.

H. Harold Scott

RELAPSING FEVER AND OTHER SPIROCHAETOSES

MAZZOTTI, L. Sobre una nueva espiroqueta de la fiebre recurrente, encontrada en México. [**A New Spirochaete of Relapsing Fever occurring in Mexico.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1949, Sept., v. 10, No. 3, 277–81. English summary.

The description of a new species of spirochaete, *Spirochaeta dugesi*, isolated from specimens of *Ornithodorus dugesi* collected in Northern Mexico near the city of Sabinas (Coahuila). The ticks were found naturally infected in nests of field rats, *Neotoma micropus canescens.*

When these ticks were fed on laboratory animals spirochaetes appeared in their blood. These spirochaetes were transmissible, from one animal to another, by means of the bite of *Ornithodorus turicata*, in addition to *O. dugesi.* Three other species of ticks, *O. parkeri*, *O. hermsi* and *O. talaje*, failed to transmit the infection, which thus seems to be biologically different from *Spirochaeta turicatae*, which is transmissible by these species.

E. Hindle

THOMPSON, P. E., DUNN, Mary C. & WINDER, C. V. **Comparison of the Actions of Chloramphenicol (Chloromycetin) and Penicillin G against Relapsing Fever in Mice.** *J. Infect. Dis.* 1950, Mar.–Apr., v. 86, No. 2, 110–21, 4 figs. [39 refs.]

It was shown by SMITH *et al.* [*Bulletin of Hygiene*, 1948, v. 23, 804] that chloramphenicol [chloromycetin] was active against spirochaetes *in vitro.* The present authors have now shown that the substance possesses activity against *Spirochaeta novyi* infections in mice, and have compared it with that of penicillin G. The experimental procedures followed were those of RICHARDSON *et al.* [this *Bulletin*, 1946, v. 43, 446], infection being produced by intraperitoneal injection of blood containing known numbers of spirochaetes, obtained by cardiac puncture. The drugs used were chemically pure, and were administered in food or by intraperitoneal injection. Their abilities at different dosage

levels to suppress acute infections and to prevent a fatal termination were compared simultaneously in several groups of 10 to 13 mice along with suitable controls. The levels of chloramphenicol in plasma after different routes of administration were determined by the method of JOSLYN & GALBRAITH (*J. Bacteriology*, 1947, v. 54, 26).

Both drugs were found to be absorbed rapidly into the blood following oral or parenteral administration, and reached peak concentrations within 30 minutes, with subsequent rapid decline as a result of degradation and excretion. In the case of mice, on drug intake in food of 67 mgm. per kgm. daily, the level of chloramphenicol in plasma was approximately 1 gamma per ml. In the drug-diet experiments, feeding was started 24 hours before infection and was continued for 5 days. The progress of the infection was determined from stained blood smears and the percentage survival was observed over a period of 15 days. By this method of administration the drugs exerted suppressive effects in different degree and on a dosage basis protection against death was afforded more effectively by penicillin G. "Thus contrast between similarity in suppression of spirochetemia and probable dissimilarity in protection against death suggests a difference between the drugs in access to vital aspects of tissue infection."

In experiments in which a single intraperitoneal injection of each drug at dose levels ranging from 6·25 mgm. to 100 mgm. per kilo was given, it appeared that less suppression and protection from death was afforded by chloramphenicol in the smallest dose, but at other dose levels the action of the two drugs was similar. Observations made *in vitro* with suspensions of the parasites, in contrast to those *in vivo*, indicated that chloramphenicol acted more rapidly and effectively. In experiments in which very heavy inocula of parasites were injected, mice were given the drugs in daily doses of 200 and 600 mgm. per kilo intraperitoneally—which approaches the toxic level for chloramphenicol—for 9½ days, and mortality data were collected for 30 days, all untreated controls having died within 7 days. It was again found that higher doses were required to protect from death than was necessary to reduce parasitaemia. Under different dosage régimes it appeared from this investigation that chloramphenicol gave more constant protection from death than did penicillin G and in explanation the authors suggest that the distribution of the two substances in the tissues may be responsible. The dosage required for radical cure has not been determined for either substance. *J. D. Fulton*

HUMPHREYS, F. A., CAMPBELL, A. G., DRIVER, M. W. & HATTON, G. N. **Rat Bite Fever.** *Canadian J. Pub. Health.* 1950, Feb., v. 41, No. 2, 66–71, 1 chart. [14 refs.]

A survey of rats trapped in Vancouver, Canada, and the surrounding country was made to determine the infection rate with *Spirillum minus*. [The species are not mentioned, but some were collected from ships after fumigation, and others are referred to as "Norway rats," presumably *Rattus norvegicus*.] A continuous investigation of the presence of plague and tularaemia among rodents is in progress and, for that purpose, the tissues can be used up to 48 hours after death. Spirilla, however, were never visible in the kidneys of 947 such rats, and the organism was isolated only 7 times from the inoculation into guineapigs of 277 pools of tissue. In a further series, 150 rats were examined immediately after death. *S. minus* was seen in the kidneys of 16, and isolated by the inoculation of pooled tissues into guineapigs on the same number of occasions.

The urines of 21 guineapigs known to be infected, and urine from 15 random "Norway rats" were injected into guineapigs. The tissues of 3 of the rats

were later shown to be infective. The urine of 3 of the guineapigs and 1 of the infective rats produced infections in the subinoculated animals. Although the number of rats examined in this test is small, the suggestion is made that foodstuffs defiled by rats might be a source of human infection.

J. C. Broom

YAWS

MIGUEL ITRIAGO, P. & MEDINA, R. Contribución al estudio de la buba en Venezuela. [**Yaws in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Med.* 1949, Oct., v. 1, No. 2, 193–214, 8 figs. [28 refs.] English summary.

Yaws exists in many parts of Venezuela ; some dozen places are mentioned : in the plains, the central States, the east and west coastal districts where it is specially rife. This article comprises a general account of yaws such as may be found in the text-books, illustrated by clear photographs of the mother-yaw, crab-yaw, secondaries, juxta-articular nodules, gangosa and goundou (the authors have seen only one case of this among 30,000 patients), osteitis and periostitis with sabre tibia.

Apart from the usual treatment by arsenicals and bismuth the authors have found penicillin in doses of 50,000 units every 3 hours of much service in the early phases, or in doses of 300,000 every 12 hours with procaine. Healing takes place in a week to 10 days.

H. Harold Scott

TRIANA, J. G. Étude schématique et comparative de la syphilis, du pian et du Mal del Pinto. [**Schematic Study comparing Sýphilis, Yaws and Mal del Pinto.**] *Ann. Dermat. et Syphil.* 1949, May–June, v. 9, No. 3, 276–89, 2 figs. [38 refs.]

Though it contains nothing new, this is a useful article bringing together and contrasting the three spirochaetal infections, syphilis, yaws and pinta. The author takes *seriatim* the following points : 1. History of *mal del pinto*, showing that it was mentioned by Cortés at the time of the Spanish conquest of Mexico, that is, before the importation of slaves from Africa. 2. The geographical distribution of the three ; syphilis ubiquitous, the others tropical or sub-tropical. 3. The associated spirochaetes, morphologically indistinguishable, but differing in cultivability. 4. Mode of transmission. 5. Incubation period. 6. The primary lesion. 7. Secondary and tertiary lesions. 8. The parts of the body affected ; syphilis practically any part but particularly the cardio-vascular and nervous systems ; yaws the bones and joints ; *mal del pinto* only the cutaneous (but the possibility of visceral lesions is still *sub judice*). 9. Time of appearance of the serological reactions ; syphilis and yaws 15–18 days after the appearance of the primary sore, pinta 3–5 or even 12 months. 10. Involvement of the cerebrospinal fluid ; common in syphilis, doubtful at least in the other two. 11. Treatment ; arsenicals, bismuth and penicillin serviceable in all.

After discussing these points in the body of the paper, the author brings them all together most instructively in a table and there is a good plate showing the primary, secondary and tertiary stages of each of the three conditions.

H. Harold Scott

LEPROSY

AUSTIN, C. J. **Leprosy in Fiji and the South Seas.** *Internat. J. Leprosy.* New Orleans. 1949, Oct.–Dec., v. 17, No. 4, 399–409, 2 figs.

This paper gives much valuable information on the development of the Fiji island of Makogai for the isolation and treatment of leprosy patients from Fiji and other British South Sea islands from 1911 to the present time. Distinctive Figian names for the disease, and other evidence, indicate that the infection has long been present in the islands. The first Fiji settlement dates from 50 years ago at Beqa island, and in 1911 forty patients were transferred to the central Makogai island settlement, under good conditions. Since then they have gradually increased to the present number of some 700, about one-third of whom now come from Samoa, the Gilbert and other islands, to their great advantage. A table gives figures classified into different degrees of severity in neural and lepromatous cases for 1911–1933 and for 1934–1948 with approximately equal numbers. It brings out the interesting fact that N3 cases decreased from 173 in the first period to only 14 in the second, and that L3 cases likewise fell from 212 to 48. This important advance was due to the introduction of assistant medical officers trained in the early diagnosis of leprosy. It also indicates that the present known number of cases is not far short of the true total, and that the disease is under control as admissions are already tending to fall. Data for the different islands are also given together with a genealogical chart for the Cook Islands, which indicates that the infections were mainly in two families. A summary of the statistics of 1911–1948 shows a total of 3,032 patients admitted (including 1,243 Indians) of whom 436 were repatriated. The discharges amounted to 910, and deaths to 1,017, in the 37 years ; and 669 remain. [If the British West Indian Islands had found it to be practicable to isolate their cases in one or more leprosaria, as in Fiji (as suggested by the reviewer nearly thirty years ago) there might have been few infective cases left in most of them by now.] *L. Rogers*

DEMPSTER, G. O. L. **Leprosy in Niue Island. A Note on the History of the Disease.** *Internat. J. Leprosy.* New Orleans. 1949, Oct.–Dec., v. 17, No. 4, 411–14, 1 fig.

This is a historical note on one of the South Sea Islands, whose leprosy cases are now being cared for at the Fiji settlement. It appears that the disease was introduced not later than the eighties of last century. A genealogical table to 1938 shows that the disease remained localized in two families, which probably accounts for its slow spread. Two persons in other families are said to have been infected by wearing the clothes of deceased leprosy patients. Details are given regarding the serious spread by contact in the two infected families. Among a Polynesian stock of about 4,000, a total of 9 males and 10 females only are known to have developed leprosy in about 50 years, in great contrast to Nauru Island where in 1925 30 per cent. of a population of 2,500 were found to be infected. *L. Rogers*

WASHBURN, W. L. **Leprosy among Scandinavian Settlers in the Upper Mississippi Valley, 1864–1932.** *Bull. History of Med.* 1950, Mar.–Apr., v. 24, No. 2, 123–48.

NOËL, R. & SOEUR MARIE-SUZANNE. A propos du diagnostic différentiel histologique de la lèpre léprometeuse et de la lèpre tuberculoïde. [**Histological Differentiation of Lepromatous and Tuberculoid Leprosy.**] *Internat. J. Leprosy.* New Orleans. 1949, Oct.–Dec., v. 17, No. 4, 389–98, 10 figs. on 2 pls.

This paper records a detailed account of the histology of lepromatous and of tuberculoid leprosy. For the most part it is in accordance with our present knowledge, but the authors stress the importance of the following differential points. In the initial period the differentiation of the two forms is very difficult and may be impossible. In the tuberculoid form the authors have never been able to identify the bacillus of Hansen, but this form shows constantly an eosinophile reaction, which never occurs in lepromatous cases. Giant cells appear slowly, remain few and contain lepra bacilli in the lepromatous form : in tuberculoid cases they are very numerous and never contain the bacilli, the nuclei are arranged around the periphery of the cells and they are always surrounded by epithelioid cells, as in tuberculosis. *L. Rogers*

BASOMBRIO, G. & GATTI, J. C. Estudio comparativo entre la lepromina bacilar (Fernandez) y la lepromina cadavérica (Campos). [**Comparative Study of Bacillary Lepromin and Lepromin** "*ex cadavere*".] *Internat. J. Leprosy.* New Orleans. 1949, Oct.–Dec., v. 17, No. 4, 379–82.

The present-day treatment of leprosy by sulphones and other modern drugs has resulted in killing the organism and reducing the numbers of lepromata, so that the source of material for preparing cutaneous lepromins is becoming scarce. Hence the suggestion of Dr. R. C. Campos of Peru that lepromins might be prepared from organs rich in the bacilli from the bodies of lepromatous patients [this *Bulletin*, 1950, v. 47, 247].

By " Fernandez lepromin " the authors imply the preparation, of a strength of 1 per 2,000, obtained from cutaneous lepromata ; by lepromin " *ex cadavere* " the preparation at 2 per 1,000 obtained at autopsy from the liver and spleen of a recently fatal case of the lepromatous type. The tissue is cut into small pieces and boiled for 10 minutes in physiological saline and thereafter treated in the manner described by Dharmendra for preparing bacillary lepromins from cutaneous nodules. Reactions to these were read after 48 hours—the early Fernandez reaction—and after three weeks—the late Mitsuda reaction. For purposes of recording, the reactions were graded as follows : 1. The early Fernandez reaction. No red halo or one less than 5 mm. in diameter, negative ; a halo between 5 and 10 mm., doubtful ± ; between 1 and 2 cm. + ; more than 2 cm. ++. 2. Later, Mitsuda reaction, read at the end of the 3rd week. A nodule as large as a pin's head, palpable rather than visible, doubtful, ± ; a definite nodule or lenticular papule, + ; a large papule or ulceration, ++.

The tests have been tried on 22 subjects, with the two lepromins, the bacillary and the "*ex cadavere*". Five were patients with the lepromatous form ; 14 the tuberculoid, 2 undifferentiated, and one in good health but living with a lepromatous patient. Of the 5 lepromatous cases, in 4 the results were the same in the early stage ; in the late, 3rd week, all five were the same. Of the 15 tuberculoid cases, 13 were discordant by the 48-hour test and only one in accord, but at the 3rd week reading 11 were concordant and only 3 at variance. Of the two indifferent cases, at the early reading one was concordant and one discordant ; at the late reading both were concordant. In the healthy subject all the reactions agreed.

Taking all 22 together it will be seen that at the 48-hours' reading 7 were concordant and 15 discordant ; at the 3rd week reading 19 were concordant and only three discordant.

The authors conclude that though "bacillary lepromin" is the better because the results are more precise in spite of the lower concentration, nevertheless the "*ex cadavere*" preparation is very useful in that the third week readings are to a great extent concordant and this is particularly so now that preparations from cutaneous lepromata are not easy to come by. The results are presented in a tabular form also. *H. Harold Scott*

DHARMENDRA & MUKHERJEE, N. **Intradermal Reaction with Lepromin Inside and Outside the Leprous Macules.** *Leprosy in India.* 1950, Jan., v. 22, No. 1, 5–10.

The authors have investigated lepromin reactions within and around leprous patches, with regard to which reports are somewhat contradictory. They found that in lepromatous cases the usually negative reactions are similar and of the same intensity within and without lepromatous lesions, but when any difference was noted the reaction was most frequently strongest outside the patches irrespective of their thickness. On the other hand, in neural cases the reaction is usually strongest inside the patch, but in a small number of cases the reverse is the case. Moreover, the thicker the neural patch the greater the degree of reaction to lepromin. Variations in the reactions in different parts of the body have not been found to be marked. *L. Rogers*

BINAGHI, G. Il mielogramma nella lebbra. [**The Myelogram in Leprosy.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Jan., v. 31, No. 1, 46–56. [25 refs.] English summary.

The author presents in a table the constituent cells of the sternal marrow and of the peripheral blood in 10 leprosy patients. The findings in the latter indicated slight anaemia, the lowest red cell count being 3,560,000, the highest 5,100,000 per cmm.; only 4 were below 4 million. The haemoglobin values mostly ranged between 75 and 85; two were 72 and one as low as 55, and colour index between 0·98 and 0·7. All showed eosinophilia, one as high as 14 per cent., though no intestinal parasites were found in any of the patients; neither anisocytosis nor poikilocytosis was marked. Leucocytes were usually about normal with, perhaps, a leaning towards the lower limit; four were below 6,000 per cmm. In the marrow the point most noticed was the "advanced maturation of the nuclei with immaturity of the protoplasm" of the erythroblasts; it was also noticed particularly in the myelocytes and promyelocytes, and in two of the patients many free nuclei were seen. The relative increase in basophilic erythroblasts is interpreted as evidence of medullary hypoplasia. These changes, says the author, are observable in diseases other than leprosy and are, therefore, not characteristic. [Nothing is said as to the stage or form of the disease in these cases.] *H. Harold Scott*

LANCEPLEINE, J. Cholestérinémie, calcémie et glycémie chez les lepreux de l'A. O. F. [**Blood Levels of Cholesterol, Calcium and Glucose in Leprosy Patients in French West Africa.**] *Méd. Trop.* Marseilles. 1949, July–Aug., v. 9, No. 4, 502–18.

The recorded biochemical estimations in these cases of leprosy have been controlled by estimations in healthy young controls on the same diet. The cholesterol levels in 48 cases are summarized in a table and are as follows. Taking the normal limit of cholesterol in the blood as varying from 1·95 gm. to 1·5 gm. per 1,000 cc. [given in the text as per 100] the controls showed higher

rates in 12·5 per cent. and lower ones in 18·75. The corresponding figures in lepromatous cases were 6·5 above and 82·8 below the normal and in nerve cases 12·5 above and 37·5 per cent. below the normal. The calcium content of the blood was likewise estimated in 36 cases, of which details are recorded : in 23 of these the clinical and laboratory interpretations were in accord and in 11 they were doubtful or in disagreement. The author concludes that a manifest and continued decline of blood calcium is due to an aggravation of the symptoms or the imminence of a leprosy reaction. Glycaemia was also estimated in 51 cases, and it was found that none of the controls showed rates below the normal limits of 1·10 to 0·90 of glucose per 1,000. In lepromatous cases 15·9 per cent., and in nerve cases 30·0 per cent. showed readings below the normal limit. The degree of hyperglycaemia found, on the other hand, was little different from that in the healthy controls. *L. Rogers*

BARNETSON, J. **Oscillometric Studies in Neural Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 535–8. [15 refs.]

This note records investigations of peripheral circulatory changes by means of an instrument which measures the amount of pulsation transmitted to an air-filled cuff applied to a limb, with an indicating needle to record the movements. It is used for diagnosis of obliterative lesions of arteries of limbs. Tables of observation on 20 early and 19 advanced cases of nerve leprosy indicate that there was no occlusion of arteries and larger arterioles of the wrist and ankle in cases of neural leprosy. *L. Rogers*

BARNETSON, J. **Skin Temperature Studies in Neural Leprosy.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 539–44.

Reactions in neural leprosy to (1) local warming and cooling of feet, and (2) placing a hand and forearm in cold or hot water to elicit reflex vasomotor changes in other limbs, were recorded in eight and twenty early, and nine and fourteen advanced cases respectively : the results are shown in tables with the following conclusions. Dilatability of peripheral vessels is not impaired, but there is failure of reflex vaso-dilatation corresponding roughly to neurotrophic bone changes and anaesthesia, due to destruction of vasomotor fibres in the peripheral nerves by leprous neuritis and increasing as the destruction of nerve fibres progresses. *L. Rogers*

See also p. 769, BARNES, **A Case of Filarial Elephantiasis of the Face resembling Nodular Leprosy.**

LAURET. L'activité du S.G.H.M.P. dans la lutte contre l'endémie lépreuse au cours des quatre dernières années. [**The Activity of the Mobile Hygiene and Prophylactic Service in the Campaign against Leprosy in the Last Four Years.**] *Bull. Méd. de l'Afrique Occidentale Française. (Journées Méd. de Bobo-Dioulasso 24 au 29 Jan. 1949.)* 1949, No. Spéc., 99–106.

A Service of General Hygiene and Prophylaxis of a mobile nature has been carrying out a campaign since 1946 in French West Africa to find and treat cases of leprosy, with the result that the cases under observation have increased within four years from 8,500 to 53,900. Numerous figures are given of the populations examined, which run into millions. In about 19,000 classified cases only 13 per cent. were lepromatous, which is considered to be below the true number. In 34 hospital treatment centres 1,299 patients were treated in 1947 by injection of chaulmoogra esters. It is too early to report results, but records are being kept. These efforts have been rewarded by encouraging results, but it will require persistent efforts to consolidate them. *L. Rogers*

BRYGOO, E. Essai de traitement de la lèpre par la diasone. Cinq mois—dix observations. [**A Trial of Diasone in Ten Cases of Leprosy over a Period of Five Months.**] *Méd. Trop.* Marseilles. 1949, July–Aug., v. 9, No. 4, 597–604.

The author has tried diasone in ten cases of leprosy for five months and records details of them. Gradually increasing doses were given orally up to a total of 148–2 gm. and they were well borne. A mild degree of anaemia was noted. Weight was stationary except for increase in one case. Out of nine bacteriologically positive cases only two became negative and four out of six with positive nasal smears remained positive. Lepromata have softened or disappeared. The time is too short for definite conclusions, but the results are very encouraging. *L. Rogers*

FLOCH, H. & DESTOMBES, P. Traitement de la lèpre par le diamino-diphényl-sulfone. [**Treatment of Leprosy with Diamino-Diphenyl-Sulphone.**] *Bull. Soc. Path. Exot.* 1949, v. 42, Nos. 9/10, 434–9. [12 refs.]

Since November 1948 the authors in French Guiana have administered this preparation—which is the active part of promin, diasone, etc.—in doses of 20 mgm. orally, or else intramuscularly in a 5 per cent. solution, to 110 leprosy patients, including 53 lepromatous, 28 indifferent and 29 tuberculoid cases, and deal with all those treated for three months and longer. The mucous lesions, especially of the nose, first improved and the results were at least equal to those obtained with promin and other sulphones. The daily dose in some cases has been pushed up from 80 to 260 mgm. a day orally after three months and in others to 300 mgm. intramuscularly, with no ill-effects except slight anaemia. The results of the use of this "parent-sulphone" have been most encouraging and it is undoubtedly the drug of choice in leprosy, especially in lepromatous cases. *L. Rogers*

FLOCH, H. & DESTOMBES, P. Traitement de la lèpre par la "sulfone-mère" (Diamino-Diphenyl-Sulfone). [**Treatment of Leprosy with "Parent Sulphone" (Diamino-Diphenyl-Sulphone).**] *Internat. J. Leprosy.* New Orleans. 1949, Oct.–Dec., v. 17, No. 4, 367–77. [15 refs.]

In this paper the authors report that the oral use of the parent sulphone enables a more constant blood concentration to be obtained than with other commonly used sulphones. The doses used are initially 60 mgm. daily, given on six days of the week with an interval of one week after two months, and the daily dose is pushed up by 40 mgm. weekly to 200 mgm. by the fifth week. Oral treatment has been given in 80 cases and intramuscular in 21 others. Many of the cases were advanced lepromatous ones, but more rapid improvement is obtained in recent cases. A table shows that out of 35 cases treated orally 26 (74 per cent.) improved, 8 were stationary and 1 was worse. By intramuscular injection, out of 11 cases 10 improved and 1 was worse. These results compare favourably with those reported in the case of the compound sulphones mainly used hitherto. Race did not affect the results. The clinical improvement was similar to that obtained with the most commonly used sulphones, with less spectacular benefit in indifferent and tuberculoid than in lepromatous cases. Anaemia, minor digestive disturbances and urticaria after injection of the drug were mild and easily controlled; reactions were noted in 23 per cent. The number of lepra bacilli in the affected lesions steadily diminished, but negative findings have not been obtained. *L. Rogers*

LAVIRON & LAURET. Les expérimentations en cours à l'Institut Marchoux. [**Therapeutic Trials against Leprosy in the Marchoux Institute.**] *Bull. Méd. de l'Afrique Occidentale Française.* (*Journées Méd. de Bobo-Dioulasso 24 au 29 Jan. 1949.*) 1949, No. Spéc., 107–12.

This paper deals with short trials of yet more sulphones. Sulphathiazole produced some benefit, but less rapidly than did other sulphones. A product, Fontamide Cinnam, 3251 R.P., has also been tried intravenously in 11 patients with benefit and a diminution of lepra bacilli in the affected tissues and with good clinical effects in tuberculoid cases. A third preparation, 3668 R.P. (Rodilone Cinnam), is said to have a composition identical with the British sulphetrone. It has been given both orally and intravenously, with clinical improvement towards the third month. These preparations are considered to be rich in promise, but the authors conclude with the statement that they have incontestable photographic proof of the activity in leprosy of chaulmoograte; although this is slow as compared with that of sulphones, chaulmoograte should not be forgotten or rejected. *L. Rogers*

SCHNEIDER, J. Sulfones et sulfamides dans la lèpre. [**Sulphones and Sulphonamides in Leprosy.**] *Bull. Méd. de l'Afrique Occidentale Française.* (*Journées Méd. de Bobo-Dioulasso 24 au 29 Jan. 1949.*) 1949, No. Spéc., 123–6.

In this paper the preparations described by LAVIRON and LAURET [above] are reported on favourably, especially the French form of sulphetrone called 3668 R.P. The doses were 1 gm. a day in the first week and 2 and 3 gm. a day respectively in the second and third weeks, followed by rest for a week. The author obtained remarkably rapid improvement, especially in florid lepromatous cases, in spite of interruptions during reactions. At the end of a year the results were certainly more spectacular than with other sulphones, although the drugs were given in much smaller doses than the British form of sulphetrone, with which the author was unacquainted when he started his work. Toxicity is also discussed; only moderate anaemia was prominent. The author discusses the question of combining anti-anaemic substances with sulphetrone, but the cost would be increased materially, which is a disadvantage.

L. Rogers

BARBA RUBIO, J., ACEVES ORTEGA, R. & FLORES NAVARRO, J. Empleo del acetato de d-l-alfa-tocoferol (Ephynal). En el tratamiento de las amiotrofias en enfermos de lepra. [**Ephynal in the Treatment of Leprous Amyotrophy.**] *Medicina.* Mexico. 1950, Feb. 10, v. 30, No. 597, 48–50.

Ephynal, or vitamin E, alphatocopherol, was injected in a strength of 0·025 mgm. of the acetate in 1 cc. of sesame oil. It was used for the treatment of leprosy patients with wasting of muscles, the results of nerve involvement. The patients were suffering from the tuberculoid and lepromatous types of the disease. The total weekly dose was 1–3 cc. with injections of 0·2–0·3 cc. each into most of the muscles affected. The nerves themselves were operated upon to free them from compression by inflammatory products.

The method has been tried in 19 patients and the authors express satisfaction at the results attained. The treatment is continued for 4–6 months and, naturally, the best results are seen in the earlier cases; little benefit is seen in those more advanced. The sulphones may be given as well. [It is not easy to decide to which part of the treatment the improvement was principally due.]

H. Harold Scott

HELMINTHIASIS

WIGAND, R. Chemotherapie der Helminthiasen. [**Chemotherapy of the Helminthiases.**] *Zent. f. Bakt.* I. Abt. Orig. 1949, Aug. 25, v. 154, Nos. 3/5, Bericht pp. 98*–110*.

This is a paper at a conference reviewing the clinical aspects of chemotherapy as applied to the helminthic infections which occur in man in Central Europe. No compounds are known which are active against hydatid cysts or circulating larvae of *Ascaris*, etc. Treatment is also unsatisfactory for worms like *Paragonimus*, *Trichinella*, etc., which live in the tissues. It is easiest against the worms of the intestine. A long table is given summarizing the action of numerous anthelmintic drugs. Unfortunately most of these preparations are unsatisfactory in some respects. Progress in the chemotherapy of the helminthiases has been disappointingly slow compared with the progress made in the treatment of bacterial infections. The rest of the paper consists of a discussion of the factors leading to this present unsatisfactory state of affairs, and of suggestions how this might be remedied. *F. Hawking*

ALWAR, V. S. **A Note on Schistosomes in India, with a Review of the Literature.** *Madras Vet. College Ann. 1949–50.* 30–35. [40 refs.]

DAVIES, E. R. & STEWART, I. S. **Vesical Carcinoma with Bilharzia.** *Brit. Med. J.* 1950, May 13, 1114–15, 1 fig.

A case in Iran.

PONS, C. A. & REYES, F. M. **Manson's Schistosomiasis in Puerto Rican Soldiers.** *Puerto Rico J. Pub. Health & Trop Med.* 1950, Mar., v. 25, No. 3, 319–23. [Spanish version 324–8.]

In post-mortem material of 34 men between the years of 18 and 36 dying from diseases other than schistosomiasis, submitted from various posts in the Carribbean area and studied at Porto Rico, evidence of schistosomal tubercles was demonstrated in the liver in 14 out of 33 portions of liver tissue examined.

Minimal fibrosis of the portal spaces was found only once. In the rest the livers were normal except for the presence of a few pseudo-tubercles and ova.

In 16 cases specimens of colon were available for study. Of these eight presented egg-shells in the submucosa. Each of these cases revealed tubercles in the liver, but an additional case with remnants of ova in the colon showed no evidence of bilharzial damage in the liver. Splenomegaly was not seen nor were pseudo-tubercles found in the spleen.

In four subjects there were pseudo-tubercles in the lungs. Material from the central nervous system was available in half the cases, but no ova or bilharzial lesions were noted in this tissue. A few stray ova were seen in the pancreas, prostate and mesenteric lymph nodes.

The finding of an infection rate of over 40 per cent. in 34 consecutive unselected autopsies suggests [according to the authors] "a greater diffusion of this parasitosis than is generally admitted." *M. Gelfand*

MARTINS, A. Vianna. Diagnóstico de laboratório da esquistossomose mansoni. [**Laboratory Diagnosis of Schistosomiasis mansoni.**] 265 pp., 22 figs. [Bibliography.] 1949. Belo Horizonte : Imprensa Oficial.

This is a thesis by the Professor of Zoology and Parasitology of the University of Minas Gerais, Brazil, and consists of a brief introduction and seven chapters, a final statement of the author's conclusions and a bibliography.

Much has been written on the diagnosis of schistosomiasis ; several methods have been suggested and described ; each has or had its enthusiastic supporters and each also its detractors. Their very multiplicity indicates that no one of them is altogether satisfactory. In this book Professor Martins reviews these methods and relates his own experiences based on 2,253 cases in the 17 months, September 1947–February 1949. Another 457 living in zones where the disease is not endemic serve as controls. Details were taken of each : name, age, sex, colour, place of birth and residence, and whether previously treated for the infestation. Intradermo-reactions were carried out with at least two antigens, faecal examinations by sedimentation, and blood was taken for serological tests, and, in many cases, specimens for rectal biopsy. Ova were found in the faeces or in biopsy specimens of 1,337, and 670 were given antimony. The author in his preface says he will treat also of modifications of the blood picture resulting from treatment and of the immunity reactions produced by the worm.

In the chapter dealing with faecal examinations the important point of variation in the elimination of ova is referred to and the causes are stated to be : (1) The ova being within the veins, in the early stages when the tissues are undamaged, many will work through into the lumen of the bowel ; later, owing to trauma and inflammation, the tissues become fibrosed and penetration of ova impeded and more difficult. (2) Egg-laying becomes less as the age of the worm increases. (3) The varying distribution of the sexes ; if males predominate, the ova appearing are fewer. (4) Lastly, there is a varying rhythm of oviposition, so that as long a period as three weeks may elapse between two positive faecal examinations.

Several methods of faecal examination are described : (1) Direct ; this is the least satisfactory and may miss up to half the cases. (2) The floatation method of Willis or of Faust. (3) Sedimentation methods with various diluents—water, NaCl solutions, glycerin, Na_2SO_4, Triton NE, Tween 80 and others. (4) Centrifugation after homogenization with various fluids [this seems to overlap with the preceding]. (5) Screening. (6) Ecdysis of miracidia, as proposed by Fülleborn in 1921. Each of these is discussed in turn and the results are given as reported by different observers. Of the author's 1,337, ova were seen in the faeces of 1,294 ; the other 43, repeatedly negative, gave a positive finding with rectal biopsy. Of 1,223 with negative faeces, 594 gave a positive skin reaction. A comparison of the three tests is given by the author in the following figures : Of 64 faecal examinations five (8 per cent.) were positive ; of 67 rectal biopsies 33 (49 per cent.), and of 67 skin tests 39 (58 per cent.) were positive. This chapter is embellished by pictures showing young and older ova, and the distinction between living and dead, degenerated and calcified ova.

After quoting figures recorded by others, the author reports his own findings and analyses them in different ways, giving the numbers positive by direct examination and by rectal biopsy, these and the skin tests being shown for each of 251 patients in a Table. At least two intradermo-reactions have been tried on each of 2,560 persons suspected of being infested, 6,000 tests altogether, and on 150 controls from non-endemic districts. In 1,337 the suspicion was confirmed by finding ova in the faeces or by rectal biopsy. Antigens used were

(i) cercariae ; (ii) adult worm extracts ; (iii) hepato-pancreas of vectors ; (iv) heterologous, as *Eurytrema coelomaticum*. The effects of age, sex, colour and severity of infestation are noted in regard to the reaction. The modes of preparation of the antigens are described and again is appended a Table of the results of the tests before treatment and at various intervals after it, and control of the treatment by faecal examination and biopsy. Photographs are reproduced illustrating the cutaneous response.

Next, complement fixation with several antigens : heterologous such as alcoholic extract of *Fasciola hepatica*, and preparations of the hepato-pancreas of *Australorbis glabratus*, according to Fairley's technique as modified by Meyer and Pifano, or the author's own modification of Fairley-Meyer-Pifano ; this modification consists of the fixation of complement in three haemolytic units and the use of 0·05 and 0·1 cc. of serum. Kolmer's technique was also used. Here, once more, the author presents in protocols the results of these tests and concludes that they need considerable skill and further modification or improvement (*precisa ser aperfeiçoada*) before complement fixation can be brought into general use ; at the same time he finds it of great value in particular cases and especially if used in conjunction with the intradermo-reaction.

A few remarks are made on other serological reactions—flocculation, agglutination, formol-gel, and the Henry-Wolf, but the author does not appear to have a high opinion of these and the same holds good of the test of " provoked eosinophilia " set up by administration of antimony.

The book is well produced, the print is clear and on good paper, and documented by a bibliography of more than 200 references, some as recent as 1948. *H. Harold Scott*

Hernández Morales, F., Santiago Stevenson, D., Pérez Santiago, E., Oliver González, J. & Maldonado, J. F. **The Acid-Ether Concentration Test, the Rectal Biopsy, and the Skin Test in the Diagnosis of Manson's Schistosomiasis.** *Puerto Rico J. Pub. Health & Trop. Med.* 1950, Mar., v. 25, No. 3, 329–34. [Spanish version 335–41].

The authors conducted an investigation into relative diagnostic values of the *Schistosoma mansoni* cercarial antigen skin test, the microscopical examination of stools by the acid-ether concentration method and the rectal biopsy technique. The intradermal injection ordinarily consisted of a 0·1 cc. of a 1/10,000 dilution of cercarial antigen. The authors divided their results into three groups.

In the first group, out of 38 persons passing ova, 30 showed a positive skin reaction and 31 positive rectal biopsy snips.

The findings in the second group revealed that the skin test and rectal biopsy technique were superior to stool examination. Of 317 persons having skin tests, 49·5 per cent. were positive ; 50·7 per cent. of 119 biopsies revealed live, or dead, eggs in the rectal tissue ; and eggs were found in 11·5 per cent. of 121 stool examinations. In some patients, who had never received therapy, dead eggs were found in the mucosa and the assumption was that these subjects had undergone spontaneous cure.

In the third group, the results corresponded roughly to those in the second. In both these groups, however, the figures and tables are somewhat difficult to interpret.

The authors appear to conclude from their study that the skin test and rectal biopsy " prove far superior to the stool examination in diagnosing this condition ". " However, it should be pointed out here ", they state in

conclusion, " that none of the three tests can be used to the exclusion of the others since one might be negative and the other two positive." *M. Gelfand*

MAYER, M. & PIFANO C., F. Experiencias de ocho años en la elaboración y aplicación de un antígeno de vermes adultos de *Schistosoma mansoni* para la intradermo-reacción diagnóstica de la bilharziosis. (Con descripciones detalladas de la técnica y nuevas investigaciones). [**New Antigen for an Intradermal Diagnostic Test for Schistosomiasis mansoni.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 1–35, [20 refs.] English summary.

In this article the authors describe the results of 8 years' work on antigens which they have been preparing and testing for the diagnosis of infestation by *S. mansoni*. It is a most interesting summary of their work and in the main may be regarded as an amplification of that already abstracted [see this *Bulletin*, 1949, v. 46, 757]. In one important particular the authors have modified and improved their former method of extraction of their antigen, *Bilharzina*. Having ascertained that the antigen will stand heating to 100°C., they have tried extracting it at 56°C. This temperature is chosen in order to avoid precipitation of the proteins. The pulverized worms extracted in Coca's solution [see above reference] are placed in a tube in a waterbath at 56°C. for half an hour and stirred every 5 minutes with a glass rod and then filtered. When tested, this rapidly prepared antigen gave the same results as one prepared by the former method of a two-week extraction in the ice-chest. This method of preparing the antigen is not only quicker but simpler.

Tests of the resistance of the new antigen are described, titration of it, reading of results and instances of its specificity are referred to. The authors state that they have themselves made trial of it in more than 5,000 cases and by the end of 1948 some 30,000 such reactions have been carried out at dispensaries to which suspected patients are sent. There is one difficulty yet to be overcome. It is not yet known how long after the cure the reaction becomes negative and, further, " at present we can say that a negative reaction after treatment is not a proof of cure." The main use of the test is in diagnosis.

H. Harold Scott

PIFANO C., F. Aspectos clínicos del síndrome de Banti bilharziano en Venezuela. [**Clinical Aspects of Banti's Syndrome in Schistosomiasis in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 41–73. [26 refs.] English summary.

This study is based on 182 cases observed during the ten-year period, 1938–1948. The patients were all from country districts where defective nutrition was rife and parasitism common—hookworms, *Fasciola hepatica*, malaria and Chagas's disease. The author defines the syndrome as consisting of enlargement of spleen with cirrhosis of the liver, leucopenia, haemorrhages and a terminal ascites. This condition and its association with *S. japonicum* was noted and recorded by MATHIS and LÉGER in 1913. The commonest age was between 20 and 34 years, but the limits in the author's cases were eight and 44. One hundred and twenty-three of the 182 cases were in males, 59 in females, but this difference is to be explained, in part at least, by the former being more exposed to infection. Faecal examination revealed abundant ova in 47 (25·8 per cent.), few in 90 (49·4), very scarce in 27 (14·1) ; in the remaining 18 repeated examination failed to find them, though in some they had been seen previously. Other means of diagnosis were complement deviation by Fairley's method and the intradermal

bilharzin test of MAYER and PIFANO. The author states that in some patients the eggs become fewer and finally disappear altogether even though there has been no treatment with antimony.

According to the author the syndrome develops in three clinical stages. In the first, there is moderate splenomegaly, slight hepatomegaly and anaemia with leucopenia and eosinophilia ; in the second, greater splenomegaly and hepatomegaly and more severe anaemia and haemorrhages in the alimentary tract, evidenced by haematemesis and melaena, and, in some cases, diarrhoea, perhaps of a dysenteric type ; in the third stage, there is cirrhosis of the liver with atrophy, great enlargement of the spleen, serious anaemia with leucopenia, lymphocytosis, a fall in eosinophiles even to absence of them, severe haemorrhages and ascites.

Each of these is described in detail and the pathological changes in spleen and liver. Forty-six had haemorrhages, three " fulminant ", 15 repeated and 28 on a single occasion ; 14 occurred in the second of the three stages mentioned above, 32 in the third, none in the first. Jaundice was not very common ; it was seen in three in the first stage, in seven in the second and in ten in the third. In 32 of the patients the type of anaemia was more closely studied. In 17 it was macrocytic and hypochromic, in ten microcytic and hypochromic, in five macrocytic and hyperchromic.

The syndrome is chronic and slow in development but may be interrupted by severe haemorrhages and ascites which is transient at times, at others, persists and is accompanied by the appearance of a network of abdominal veins and symptoms of portal hypertension [obstruction]. The anaemia is progressive.

Splenectomy is discussed and on the whole recommended, especially in the early stages. Ascites is regarded as a contra-indication, particularly when it recurs again and again after paracentesis. *H. Harold Scott*

GRAHAM, J. G. & ORR, J. L. **Hepatic Abscess associated with Visceral Schistosomiasis.** *Lancet.* 1950, Apr. 15, 714–16.

An Army officer served in Madagascar and East Africa, where he suffered from malaria but from no other known illness, and returned to the United Kingdom in 1945. In August 1946 he developed a febrile illness which began with a rigor and which failed to respond to mepacrine or to sulphapyridine treatment. He then had pain and dullness at the base of the right lung so was given penicillin, but without material improvement. As a leucocytosis of 18,000 (without eosinophilia) was observed a course of emetine was then given, although no parasites were found in the stools, but without benefit. As the right diaphragm was now rising and there was limitation of its movement the presence of a subphrenic abscess was suspected ; an incision was made below the twelfth rib, the perinephric area was unsuccessfully explored for pus, but thick creamy pus was obtained from the right lobe of the liver. This was evacuated, a drain was inserted, and the pus and some material from the wall of the liver abscess was sent for examination. The patient made a good recovery under penicillin and further emetine treatment. The pus yielded a heavy growth of *Staph. aureus* but no parasites were found in it ; but sections of the liver wall showed small tubercle-like foci containing spined schistosome eggs (species not determined), so the patient was treated with anthiomaline. Repeated urine and stool examinations, and cystostomy [*sic* ; in summary cystoscopy] and sigmoidoscopy all failed to reveal evidence of a schistosome infestation.

The patient had had an infected tooth socket, and the authors think this may have been the source of a pyogenic infection of the liver in locations determined by the pre-existent symptomless schistosomal lesions. *A. R. D. Adams*

HERNÁNDEZ MORALES, F., PRATT, Caroline K., OLIVER GONZÁLEZ, J. & MALDONADO, J. F. **The Treatment of Manson's Schistosomiasis with Anthiomaline, Ureastibamine, Neostibosan, and Stibanose. Report of a Two-Year Follow-Up.** *Puerto Rico J. Pub. Health & Trop. Med.* 1950, Mar., v. 25, No. 3, 310–13. [Spanish version 314–18.]

The authors carried out an investigation into the value of anthiomaline, urea stibamine, neostibosan and stibanose in *Schistosoma mansoni* infestation. As much of the selected drug as could be tolerated over a period of about 14 days was administered. All the subjects were in good physical condition, passing live ova in the stools and were admitted to hospital for treatment. Six patients were treated with anthiomaline, 14 with urea stibamine, 12 with neostibosan and 12 with stibanose.

The immediate effects of therapy with anthiomaline are described as very favourable, a daily dosage of 3 cc. resulting in the disappearance of live eggs about the tenth day. No alarming toxic manifestations were noted, but symptoms, such as abdominal pains, anorexia, facial oedema, dizziness and pains in the joints, are recorded. In some cases treatment had at times to be temporarily interrupted on this account. In all these cases, up to a period of three years after treatment, no viable ova were detected and rectal biopsies proved negative.

With urea stibamine, one patient died on the ninth day (having received 5·03 gm. of the drug) and in 11 cases living ova were still noticed at the end of the treatment. Toxic reactions were frequent in most cases.

The results with neostibosan and stibanose were disappointing both with regard to immediate and later results.

The findings indicated that anthiomaline was a more effective therapeutic agent against *S. mansoni* infestation than urea stibamine, neostibosan or stibanose.

M. Gelfand

CAMERON, I. G. & VAN SOMEREN, G. R. C. *Schistosoma mansoni* **Infection** [Memoranda.] *Brit. Med. J.* 1950, May 13, 1117.

The authors, in Kenya, treated two European boys of 10½ and 12 years with miracil D : the boys suffered from *Schistosoma mansoni* infection, probably contracted three years previously when paddling in a local stream. The infections had resisted prolonged antimony treatment. At the time of examination, in the early summer of 1949, both patients had viable eggs in the faeces.

Both boys were given 27 mgm. of miracil D per kgm. of body weight orally each day for three days. In the first case, the drug was given in gelatin capsules each containing 200 mgm. to minimize gastric irritation, but vomiting occurred after the third dose : this was allayed by milk. In the second case, the patient received "tabloid nilodin", an enteric-coated preparation of miracil D : this caused much less gastric irritation than the preparation in capsules and there was very little nausea and no vomiting.

No ova were found on weekly stool examinations for two months : thereafter, the cercarial antigen test [this *Bulletin*, 1948, v. 45, 1094] which had been positive a year before, was now found to be negative. Up to March 1950, all stools have been negative. It is assumed therefore that cure is now complete.

The authors note that while miracil D has produced a satisfactory percentage of cures in *S. haematobium* infections, it has not been as successful hitherto in *S. mansoni* infection [see also this *Bulletin*, 1949, v. 46, 556, 848].

H. J. O'D. Burke-Gaffney

PINTO, D. B. & PENIDO, H. M. Nota sôbre o efeito planorbicida do complexo sulfato de cobre-ácido tartárico. [**The Planorbicidal Effect of a Compound of Sulphate and Acid Tartrate of Copper.**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1948, Dec., v. 2, No. 2, 509–14. English summary (8 lines).

Copper sulphate has been for long used to destroy vector snails. If sodium tartrate or tartaric acid is added the effect is at least as good and the amount used is less and therefore the cost is reduced. The tartrate prevents precipitation of the copper salt by the bicarbonate generally present in surface waters and such precipitation nullifies the planorbicidal effect of the $CuSO_4$. Schistosomiasis is very rife in Brazil and the subject is, therefore, an important one. A strength of 2 p.p.m. is recommended and the author has tested it in running water and in stationary collections of water. In the former a uniform concentration is maintained by placing the salt in a receptacle through which the water passes. Allowance has to be made, of course, for the rapidity of flow and for the amount of aquatic vegetation. The death rate of snails varied in different experiments from 54 to 100 per cent. *H. Harold Scott*

POTENZA, L. Nódulos peritoneales en conejillos de Indias (*Cavia porcellus*), infectados experimentalmente con *Schistosoma mansoni*. [**Peritoneal Nodules in Guineapigs** (*C. porcellus*) **experimentally infected with** *S. mansoni*.] *Archivos Venezolanos de Patol. Trop. y Parasit. Med.* 1949, Oct., v. 1, No. 2, 74–85, 10 figs. English summary.

In the course of examining *post mortem* 356 guineapigs which had been experimentally infected with *S. mansoni*, the author observed small nodules on the serous surface of the intestine of 13 of them. These were removed, fixed and stained and a series of photomicrographs illustrate the pathological changes. Some of them were red in colour, others were white and pearly. Their contents varied; some showed granulomatous tissue and lymphocytic infiltration and epithelioid cells with macrophages. In rare instances the nodules contained the worms themselves *in copula*; more contained ova and some merely granular pigment. The author thinks that those which have neither parasite nor ova are set up by "some allergen." [Professor Hamilton FAIRLEY described peritoneal nodules in *S. mansoni* infestations of man as long ago as 1919 in the *Quarterly Jl. of Medicine* and in the *Lancet*. See also KOPPISCH, this *Bulletin*, 1942, v. 39, 563.] *H. Harold Scott*

MACFARLANE, W. V. **Schistosome Dermatitis in New Zealand. Part I. The Parasite.** *Amer. J. Hyg.* 1949, Sept., v. 50, No. 2, 143–51, 16 figs. on 2 pls. [15 refs.]

Bather's itch had been known clinically at Lake Wanaka in New Zealand for many years before MACFARLANE recognized its schistosome origin in 1944 [this *Bulletin*, 1944, v. 41, 947]. Its occurrence had also been reported, but not confirmed, from Lake Hawea, Te Anau, Alexandrina and Rotoiti (Nelson) and from several lakes in the Rotorua district. The molluscan fauna of these lakes comprised *Myxas ampulla*, *M. arguta*, *Limnaea alfredi*, *Isidora novae zealandii*, *Potamopyrgus antipodum* and *Cornucyclas novae zealandii*. A new schistosome cercaria, *Cercaria longicauda*, was present in the first three molluscan species. Its average measurements are: body 322 μ, tail 484 μ, furca 252 μ. This new cercaria resembles *C. elvae* and *C. oregonensis* but differs from them and other known forms in measurements. As teal ducks are constant inhabitants of these lakes it appeared probable that these birds were the chief definitive host, but attempts to infect two teal ducks experimentally failed. *R. T. Leiper*

MACFARLANE, W. V. **Schistosome Dermatitis in New Zealand. Part II. Pathology and Immunology of Cercarial Lesions.** *Amer. J. Hyg.* 1949, Sept., v. 50, No. 2, 152–67, 12 figs. [27 refs.]

As schistosome dermatitis was known to have affected from 20 to 30 persons annually since 1943, as a result of bathing during the summer months in Lake Wanaka, Macfarlane carried out a series of experimental infections on 51 volunteers with *Cercaria longicauda*. Maculae only, or maculae followed by small papules which appeared in one week, occurred in those who had not previously been exposed to infection. In those previously exposed to infection, maculae, papules and wheals appeared within a day. Individuals varied considerably in the severity of the response. In the primary lesions the cercariae were slowly disintegrated, parakeratotic plaques formed and by the seventh day antibodies caused an inflammatory reaction which was not markedly reflected in the histological picture. In the secondary lesions the cercariae had disappeared by the third day, being absorbed by macrophages, and there was a massive invasion of the dermis and epidermis by round cells. A slight parakeratosis sometimes appeared.

Dimethyl-phthalate, 41 per cent. in a lanoline cream base, prevented cercarial penetration in experimental infections and 5 per cent. Benadryl or 2 per cent. Pyranisamine maleate in ungentum aquosum relieved the itching when applied externally, but did not reduce the local oedema or erythema. *R. T. Leiper*

SUSSMAN, O. & PRCHAL, C. J. *Taenia saginata* **in Man and Cattle in Arizona.** *J. Amer. Vet. Med. Ass.* 1950, May, v. 116, No. 878, 365–6.

HAUSMAN, R., YOE TJIN LIONG & FOSSEN, A. **A Case of Cysticercosis, with some Notes on Taeniasis in Indonesia.** *Documenta Neerlandica et Indonesica de Morbis Tropicis.* Amsterdam. 1950, Mar., v. 2, No. 1, 59–61, 2 figs. [22 refs.]

" Description of a case of cysticercosis in a Chinese, who had never left Java."

VOGELSANG, E. G. & HERRERA, L. A. *Echinococcus granulosus* (Batch, 1786) en Venezuela. [*E. granulosus* **in Venezuela.**] *Rev. Méd. Vet. y Parasit.* Caracas. 1949, Jan.–Dec., v. 8, Nos. 1/4, 37–42, 3 figs. & 1 map. [13 refs.]

LIPPI, M. Studio del mielogramma nell'echinococcosi. [**Histology of the Bone-Marrow in Ecchinococcosis.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Jan., v. 31, No. 1, 31–45, 2 charts. English summary.

This contribution is too detailed for abstraction except in somewhat general terms. The various constituent cells of the marrow—16 types of them are detailed for each of 36 cases—are considered and though the title of the paper mentions only the myelogram, the tables include also details of the peripheral blood findings in each case. In the marrow the maturer cells are relatively more numerous than normal, whereas the immature are fewer, due, says the author, to rapid maturation of the cells. In the peripheral blood there is not much reduction in the total erythrocytes ; four had 5,000,000 or more per cmm. and only one was as low as 3,600,000, but all showed some reduction in haemoglobin and nearly all a slight lowering of the colour index. Eosinophilia was present in some [not in all, as the author states] ; in one patient it was as high as 20 per cent., but in half the cases the percentage was 2 or less. None showed a leucocytosis. *H. Harold Scott*

KOURI, P. & KOURI BARRETO, J. Discusiones en torno al *Inermicapsifer cubensis* (Kourí, 1938). [**Discussion on** *I. cubensis*.] *Rev. Cubana Lab. Clin.* 1950, Apr.–May–June, v. 4, No. 2, 45–56. [30 refs.]

This is an interesting paper delivered at a congress of laboratory technicians held in December, 1949, in Havana, Cuba. It tells the story of the first specimen of this parasite sent for identification after being passed by a child. The head of the worm was not sent, merely some gravid proglottides and the diagnosis of *Raillietina* was made. It was not until later when other specimens, including scolices, were examined and the characteristic crowns of hooklets of *Raillietina* were not to be found that the question of identity with *Raillietina* was brought up. The newly discovered parasite then had its generic name changed to *Inermicapsifer*. More cases began to be recorded and in 1949 at the University of Havana Institute of Tropical Medicine there were exhibited specimens expelled from 73 patients up to 1948.

The rest of the paper is given up to a discussion of the characters of this helminth, its nomenclature and place in nature—largely of historical interest.

H. Harold Scott

APARICIO GARRIDO, J. & PRIETO LORENZO, A. Estudios sobre anquilostomiasis. (Nota previa). Existencia de un importante foco. [**Ankylostomiasis. An Important Focus.**] *Med. Colonial.* Madrid. 1950, Apr. 1, v. 15, No. 4, 323–9. [24 refs.]

After speaking of the history of ankylostomiasis and the many reports by Spanish writers concerning this infestation, the authors mention a focus in Madrid, San Fernando de Henares, where at the present time cases have totalled " almost a hundred ", men and women working in the gardens there. Few are seriously affected and this points to the infection being recent and it is thought that they became infected in the preceding summer. One of the authors lives in this district so that opportunities for carrying out further studies on the spot are favourable. Three years ago infestation in adjacent areas was noted by VILLASANTE and his colleagues.

H. Harold Scott

LANZO, A. Studio sul sistema circolatorio nell'anchilostomiasi eritrea. [**Study of the Cardiovascular System in Ankylostomiasis in Eritrea.**] *Boll. Soc. Ital. di Med. e Igiene Trop.* 1949, v. 9, Nos. 4/5, 325–42. [28 refs.] English summary.

In considering the changes here recorded the reader should bear in mind that the number of patients studied was small, only 30 altogether. All were indigenous Eritreans. Anaemia in some degree was present in all ; slight (haemoglobin above 50 per cent. and red cells over four million) in 6 ; mild (Hb. 40–50 per cent. and red cells between three and four million) in 11 ; more marked (Hb. 30–40 per cent. and corpuscles between two and three million) in 10 ; severe (Hb. 20–30 per cent. and corpuscles between one and two million) in three. The degree of anaemia did not correspond to the intensity of the infestation. One of those with severe anaemia had only 976 worms (*N. americanus*) [per gramme ?, the measure is not stated], whereas one of the mildest grade had 2,646. The cardiac diameter was increased in 26 [stated as at 86·6 per cent.] ; oedema was uncommon ; it was seen in four only and in three was limited to the ankles ; vertigo was complained of by eight of the patients; cyanosis in some degree was present in all but one, but dyspnoea only in four when at rest ; cardiac murmurs of varied intensity were heard in 14 at the apex ; in an equal number over the cardiac area generally ; in one there was

extrasystole and arrhythmia. Blood pressure was not an important feature; in 13 it was normal, in seven there was "moderate hypotension" and in ten hypotension to a greater degree [these grades are not defined]. Twenty-two had tachycardia (80–100 beats per minute when at rest). Electrocardiographic conditions are presented in a long and full table giving details of each patient which may be summed up by saying that sinus arrhythmia was the commonest and myocardial damage was present in half the cases. *H. Harold Scott*

SOFIA, F. L'emo-mielogramma nella anchilostomiasi in Eritrea. [**Condition of the Blood and Bone-Marrow in Ankylostomiasis in Eritrea.**] *Boll. Soc. Ital. di Med. e Igiene Trop.* (Sez. Eritrea). 1949, v. 9, Nos. 4/5, 369–86. [25 refs.] English summary.

The author has studied the haemoglobin and cytology of the blood and of the marrow in 40 Eritreans infested by *Necator americanus*. In a series of very detailed tables the findings of each patient are given at the time of admission and again after eradication of the parasite. Anaemia was present in all at the initial observation but in one only was the red cell count below 2 million per cmm. In one the count was 5 million but the haemoglobin was down to 60 per cent. The anaemia was, in fact, hypochromic in type, microcytic in 34, macrocytic in six; in the more seriously infested there were anisocytosis and poikilocytosis; eosinophiles ranged widely between 1 and 45 per cent., but seemed to be in no way parallel with the degree of infestation. In the marrow there were signs of hyperactivity of the erythroblast cells, but reduction in the granuloblastic series. The changes seen after successful treatment of the infestation may be summed up by saying that the above deficiencies were being reversed and there were, as would be expected, signs of a strong tendency to return to the normal. *H. Harold Scott*

ANDRINI, F. & CASTRIOTA, L. Comportamento del potere complementare nell'anchilostomiasi. [**The Serum Complement in Ankylostomiasis.**] *Acta Med. Italica.* 1950, Feb., v. 5, No. 2, 31–3. [11 refs.] English summary.

The authors were unable to find any reliable evidence of the complement value of the serum of hookworm patients. They have, therefore, studied 20 subjects from this aspect, noting the results on the haemolytic system after 30, 60 and 90 minutes. The findings of each are presented in a table and recorded as normal or diminished potency according to the time taken. For the details those interested should consult this table where all is very plainly set out. The findings may, however, be briefly summarized by saying that in five it was normal, in seven it was slightly lowered, in three more so and in five markedly diminished, and their investigations have led the authors to conclude that the change is due to upset of the physico-chemical and colloidal equilibrium caused in the serum by the infestation. *H. Harold Scott*

COLBOURNE, M. J. **Unsuccessful Treatment of Ascariasis with Hetrazan.** *Lancet.* 1950, May 27, 996.

"Twenty-four patients infested with *Ascaris lumbricoides* were treated with hetrazan, and twenty-four with oil of chenopodium.

"In the dosage used hetrazan was less effective than oil of chenopodium in the treatment of ascariasis."

HUARD, P., GALLIARD, H. & JOYEUX, B. Étude anatomo-clinique d'un cas d'hémato-chylurie. [**Anatomical and Clinical Features of a Case of Haematochyluria.**] *Méd. Trop.* Marseilles. 1950, Jan.–Feb., v. 10, No. 1, 85–92, 4 figs.

BARNES, J. **A Case of Filarial Elephantiasis of the Face resembling Nodular Leprosy.** *Leprosy Review.* 1950, Jan.–Apr., v. 21, No. 1, 35–6, 1 fig.

An elderly African had a cut on his leg which caused a hot tender swelling : this subsided in a few weeks but was followed by epistaxis and swelling of the nose. Over some 15 years his nose and face swelled to ugly proportions and when the patient was first seen, there were thick bulbous masses about the nose and infra-orbital tissue. The nasal passages were completely blocked and vision was severely obstructed : the lips were swollen and one was everted. The whole face was thickly infiltrated and the condition (which is illustrated by a photograph) strikingly suggested nodular leprosy. This diagnosis was supported by the fact that two of the patient's sons had acquired leprosy before his own illness started.

On the other hand, the texture of the ears and the skin of the rest of the body was normal and there were no macules, infiltration, anaesthesia or enlarged nerves. A missing toe was accounted for by old chigger disease.

Repeated smears from nodules and the nasal mucosa failed to show any acid-fast organisms, but in one preparation a single microfilaria was found. Subsequent examination of wet blood films taken directly from the nodules showed the presence of "actively motile worms". It is stated that "the micro-filaria suggested the true diagnosis of Bancrofti Filariasis".

[This case is interesting from the point of view of differential diagnosis : there is no information to show whether peripheral blood was examined in addition to that from the nodules ; in the latter case alone, the presence of microfilariae might suggest an onchocercal rather than a bancroftian filariasis. In any case, the finding of occasional microfilariae in an African with such a condition is not necessarily *propter hoc* : and it may well be that the condition was due to some other cause.] *H. J. O'D. Burke-Gaffney*

BRICEÑO ROSSI, A. L. Resultados obtenidos con el Hetrazan en diferentes modalidades patológicas o clínicas de la Wuchereriasis bancrofti. [**Hetrazan in the Treatment of Conditions due to** *Wuchereria bancrofti*.] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 86–91. English summary.

The author gives brief details of ten cases of infection by *W. bancrofti*, some with hydrocele, hydrolymphocele, elephantiasis in small degree, lymphangitis, mastitis, or haematochyluria. He gave them Hetrazan in doses of 2 mgm. per kilo body weight, three times a day for periods ranging from ten to 25 days. In all cases the filarial embryos disappeared from the blood and the clinical symptoms cleared up, except that the elephantiasis to some degree remained, unless it was slight and of recent appearance. The patients were observed for periods up to 14 months after the treatment but in none were the parasites again found. *H. Harold Scott*

DEANE, Maria & DA COSTA, O. R. Relatório preliminar de experiências com o Hetrazan, feitas com o fim de verificar sua aplicabilidade no contrôle da transmissão da filariose em Belém. [**Experiences with Hetrazan to test its Use in controlling Transmission of Filaria in Belém.**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1948, Dec., v. 2, No. 2, 527–44, 1 graph. [19 refs.] English summary.

Filariasis due to *W. bancrofti* is rife in parts of the State of Pará, Brazil, and Belém is one of these. Control may be tackled from two sides, the patient

and the vector, *Culex fatigans*. The scheme here detailed aimed at the former, reducing the degree of infection below that at which the patient becomes a menace to others, generally regarded as 15 embryos per 20 cmm. of blood. With this end in view the authors started with tentative schemes to test susceptibility and observe any toxic reaction. There were two such schemes : one with a dosage of 1 mgm. Hetrazan per kilo body weight for six days ; the second 1 mgm. per kilo until three negative 20 cmm. samples of blood were obtained on three successive nights. Most of the patients thus received about 50 mgm. daily. The present report deals with 43 patients, 18 on the first scheme and 25 on the second ; 23 were males, 20 were females and their ages ranged between 13 and 58 years. All had microfilariae in samples of blood taken at night between 7 and 10 p.m. Before starting the treatment counts were made daily for three or four days.

Reduction of the number of embryos was observed even in the first days of the treatment and in some no microfilariae were seen after three days, so that a total of 200 mgm. sufficed, or even 150 mgm., but in one no effect was produced by so much as 3,720 mgm. given over 70 days. As a general rule the rapidity of disappearance depended on the initial intensity of infection or the initial number of microfilariae in the blood, but in the majority after three days' treatment the number was reduced to two or three per 20 cmm., that is, below the generally accepted infective concentration. Further study will determine whether this reduction is lasting. *H. Harold Scott*

VOGELSANG, E. G. & POTENZA, L. Onchocerca volvulus (Leuckart, 1893) Railliet et Henry, 1920. Su presencia en Venezuela. [**Presence of** *Onchocerca volvulus* **in Venezuela.**] *Rev. Méd. Vet. y Parasit.* Caracas. 1949, Jan.–Dec., v. 8, Nos. 1/4, 3–15, 10 diagrams, 7 figs. & 2 maps. [15 refs.]

The English summary appended to the paper is as follows :—

"For the first time in Venezuela has been observed the presence of Onchocerca volvulus (Leuckart 1893) Railliet and Henry 1921 in human parasitic nodules. The material collected is morphologically identical to material from Mexico, Guatemala and Africa ; therefore, Venezuelan onchocerca has an African origin."

POTENZA, L., FEBRES CORDERO, R. & ANDUZE, P. J. Nuevo foco endemico de oncocercosis humana en el mundo (Venezuela). [**A New Focus of Onchocerciasis in Venezuela.**] *Bol. Medico.* Caracas. 1949, Sept., v. 1, No. 3, 263–85, 1 map & 22 figs. on 11 pls. [35 refs.] English summary.

Much of this paper is given up to general remarks on onchocerciasis, the discovery of the filaria, its geographical distribution, pathology of the lesions and nodules, diagnosis, etc., to be found in present-day textbooks on tropical medicine.

In April, 1948, one of the authors removed a nodule from the right flank of a little girl, seven years of age, and examination proved it to be an onchocerca nodule. It was natural to suspect that this was not the only case and a visit to Quiriquire and San Antonio de Maturin, where the child had lived, and Guanaguana and Carapito nearby confirmed this. Though the authors found children with nodules on the head, no case of blindness was seen. Twenty-three nodules were extirpated and 13 of them were due to *Onchocerca* ; others were enlarged glands, sebaceous cysts, etc. The district is one of narrow valleys with many rivers and streams. The local vector is *Simulium metallicum*, but it is probable that *S. ochraceum* is present also. The character of the terrain

is well shown in a reproduction of an aerophotograph, and the worm, the nodules and the pathological histology depicted in some excellent photomicrographs. *H. Harold Scott*

MAZZOTTI, L. & OSORIO, María T. Sobre la presencia de microfilarias de *Onchocerca volvulus* en la sangre y en la orina de pacientes afectados por esta filaria. [**Embryos of *O. volvulus* in the Blood and Urine of Patients.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1949, Sept., v. 10, No. 3, 269–75. [12 refs.] English summary (6 lines).

On previous occasions when examination of the blood or urine has revealed filarial embryos, this has been undertaken in places, *e.g.*, Nigeria, where *Wuchereria bancrofti* infection exists and the investigators have concluded that the embryos were those of this species. Hence the value of the present contribution. The authors have investigated patients in the State of Chiapas, Mexico, where *W. bancrofti* is not found. Samples were taken from subjects showing many microfilariae of *O. volvulus* in cutaneous biopsy specimens ; some were undergoing treatment with Hetrazan. Of seven whose blood was examined, two showed sparse microfilariae ; one had one in 20 cc., and the other had three in 60 cc. The method used was to take 20 cc. of blood, dilute and haemolyse it in 200 cc. of 2 per cent. formol. After 12 to 18 hours the supernatant fluid is discarded and the rest centrifuged and the deposit examined for embryos.

For the urine, the specimen is diluted with an equal volume of water, left in a cylindrical tube for four hours and the deposit examined after centrifuging. Of nine patients so studied, in two a single embryo was found, one alive and feebly moving, the other motionless and perhaps dead. [This opens up afresh the question of the identity of filarial embryos found in the blood and urine of those living in districts where Bancroftian filariasis exists with onchocerciasis.] *H. Harold Scott*

VOGELSANG, E. G. & ESPÍN, J. Dos nuevos huespedes para *Capillaria hepatica* (Bancroft, 1893) Travassos 1915 ; Nutria (Myopotamus coypus) y el Ratón mochilero (Akodon venezuelensis). [**Two New Hosts for *C. hepatica*.**] *Rev. Méd. Vet. y Parasit.* Caracas. 1949, Jan.–Dec., v. 8, Nos. 1/4, 73–8, 5 figs.

" A description is made of two new hosts for Capillaria hepatica (Brancroft, 1893)—Travassos, 1915 : The nutria from Argentine Republic (Myopotamus coypus) and a mouse from Venezuela (Akodon Venezuelensis)."

JÍROVEC, O. Výskyt roupů u děti ve věku 6–14 let v Cechách. [*Enterobius* **Infection in Children of 6 to 14 in Bohemia.**] *Časopis Lékařu Českych.* Prague. 1950, May 12, v. 89, No. 19, 536–40, 3 figs. [15 refs.]

The English summary appended to the paper is as follows :—

" 2537 children aged 6–14 years were investigated for Enterobius vermicularis. 1592, i.e. 62·8% were found to be positive. The best method of investigation is Schüffner's method. The highest percentages of infection were found in rural schools and next in the border region. The lowest was in Prague. The authors consider that the most effective protective measures are the washing of the anal region with water twice daily, the maintenance of bodily cleanliness, the cleanliness of dwellings, public places (schools, hospitals, offices) and W.C.'s. The staffs of canteens and food institutions must be investigated for

Enterobius vermicularis and carriers must be freed from massive infection by suitable treatment or in the case of failure transferred to other occupations. The authors do not advocate chemotherapy in cases of slight infection since none of the remedies known and in use are effective, nor do they lead to immunity. The damage caused by the prolonged use of drugs may be greater than the pathogenic effect of the parasites on the intestine.

DEFICIENCY DISEASES

BOURNE, G. H. **Nutrition Work in Malaya under the British Military Administration.** *Internat. Ensch. f. Vitaminf.* Berne. 1949, v. 21, Nos. 2–3, 265–307, 3 figs.

This paper gives a detailed and interesting account of nutritional problems in Malaya immediately after reoccupation of the country following the cessation of hostilities in 1945. The author was the Nutrition Adviser to the Military Administration. Surveys covering 20,000 people were carried out by four clinical teams. The members of these teams also took part in a widespread propaganda campaign to improve nutritional levels by education, and were responsible for rehabilitating two nutrition laboratories and for helping to re-establish the shark liver oil industry; they also acted as advisers on nutrition to rubber estates and various commercial companies. *R. Passmore*

MUKHERJEE, S. K. **Nutritional Deficiency Oedema.** *Calcutta Med. J.* 1950, Jan., v. 47, No. 1, 1–4.

This paper records the levels of albumin, globulin and haemoglobin in the blood of 14 persons suffering from nutritional oedema in Calcutta. It is concluded that the presence or absence of oedema or its degree bears no direct relationship to hypoproteinaemia or anaemia. *R. Passmore*

VECHELIN, P. V., KEMÉNY, T. T., POZSONYI, J. & SÓS, J. **Dietary Lesions of the Pancreas.** *Amer. J. Dis. Children.* 1950, Apr., v. 79, No. 4, 658–65, 4 figs. [Refs. in footnotes.]

The first part of this paper records observations made in Budapest that children who had been subsisting on diets lacking in animal protein showed histological changes in the pancreas at autopsy. Fragmentation of the pancreatic parenchyma, cyst-like dilatation of acini and diffuse cirrhosis were found. [In the absence of any details concerning the previous dietary histories and the clinical and biochemical findings, it is very difficult to assess the significance of these purely microscopic findings.]

In the second part of the paper a full account is given of pancreatic changes produced in albino rats fed on diets in which yeast or glue was the only source of protein. Changes in the pancreas very similar to, if not identical with, the findings in children were encountered. Addition of casein or methionine to the diets exerted a protective action. In all cases the lesions affected the parenchyma and external secretory tissues only and the islets remained normal. These pancreatic changes always preceded similar changes arising in the liver.

R. Passmore

WATERLOW, J. **Liver Choline-Esterase in Malnourished Infants.** *Lancet.* 1950, May 13, 908–9.

In twenty infants admitted to the research ward at Fajara in Gambia, with malnutrition, the average plasma-esterase concentration was 22·5 units. The lowest average value for any group of undernourished Germans studied by McCANCE *et al.* (*Nature*, 1948, Jan. 10, 56) was 29 units. In two of these babies, both of whom had oedema and hypoproteinaemia, the esterase activity of the liver was determined in tissue obtained by aspiration biopsy. A second determination was made on biopsy material obtained four to five weeks later. In the interval the babies were fed on millet pap and milk. In both babies the initial level of esterase was low compared with four controls and rose by over 100 per cent. after the period on a high milk diet. Plasma choline-esterase values rose from 11·7 to 58·7 units and from 23·2 to 44·7 units respectively during treatment. From nuclear counts on histological preparations of the biopsy material, it is concluded that the esterase activity per liver cell increased 3½ times during treatment. The author points out that the low esterase activity of the cell in malnutrition may be very important in view of the possible rôle of esterases in the acetylation of amino-acids as a stage in the synthesis of protein. *R. Passmore*

NORONHA MIRANDA, R. Pelagra. Observação de um caso e inquérito sôbre sua incidência em Curitiba. **A Case of Pellagra and Study of its Incidence in Curitiba, Brazil.** *Publicações Médicas.* São Paulo. 1949, Nov., v. 20, No. 174, 21–6, 6 figs.

SPRUE

FLAMM, H. Zur Frage der Aetiologie und Pathogenese der Sprue. [**The Aetiology and Pathogenesis of Sprue.**] *Wien. klin. Woch.* 1949, Aug. 19, v. 61, No. 33, 523–5.

A good general account of sprue in which the author enumerates the various hypotheses which have been put forward from time to time, but shows that none of them really satisfactorily explains the difficulty. He goes in greater detail into the nervous and chemical theories and the parts played by the pancreas and liver indirectly through central nervous control, or loss of control, through toxic agency, and the process of fat digestion and ill-regulated fat absorption. No truly satisfying theory has yet been brought forward to account for so varied a list of symptoms—aphthous stomatitis, atrophy of organs, the macrocytic hyperchromic anaemia, the reduction of calcium, the tetany and the rest. Entamoeba infection, moniliasis, avitaminosis, infection, calcium insufficiency, none of these explains all cases.

[The author does not refer to the recent work of British authors telling of their experiences in the late war, experiences and investigations forming a prominent feature of medical periodicals in 1949 and noted in this *Bulletin*.] *H. Harold Scott*

ISRAËLS, M. C. G. & SHARP, J. **Idiopathic Steatorrhoea (Non-Tropical Sprue) with Megaloblastic Anaemia.** *Lancet.* 1950, Apr. 22, 752–7. [15 refs.]

TUCK, I. M. & WHITTAKER, N. **Vitamin B_{12} in Idiopathic Steatorrhoea.** *Lancet.* 1950, Apr. 22, 757–9, 2 figs. [16 refs.]

GIRDWOOD, R. H. **Vitamin B_{12} and Related Factors : a Clinical and Experimental Review.** *Edinburgh Med. J.* 1950, Feb., v. 57, No. 2, 72–109. [Numerous refs.]

EPIDEMIC DROPSY

MEAKER, R. E. *Argemone mexicana* **Seed Poisoning.** *South African Med. J.* 1950, May 6, v. 24, No. 18, 331–3.

In August, 1947, in the north-western Cape District of South Africa seven coloured persons working on a farm were attacked by a disease characterized by swelling of the legs, dyspnoea, slight enlargement of the liver and occasional diarrhoea. One patient died. Investigation elicited the fact that the previous year a similar outbreak had occurred on another farm, where five had been attacked (all coloured persons) and three had died. Examination of the food grain supplied to the workers showed it to contain 13·5 per cent. of the seed of *Argemone mexicana*, and inspection of two local mills demonstrated that, though means were taken to winnow out these seeds, the farmers would collect the rejects for feeding the coloured workers and the poultry.

The symptoms were fairly typical of epidemic dropsy, as described in text-books, except that the gastro-intestinal were not so marked as in the Indian cases, and skin eruptions were less common and less in evidence. The diastolic blood-pressures were remarkably low : in four patients they were 65, 60, and two of only 20 mm. Hg. Gross post-mortem findings were those associated with myocardial failure—pericardial, pleural and peritoneal effusions. Necrobiotic changes prevented accurate records of the pathological histology of the organs. [The author states that at the time he "could not obtain any literature on Argemone Mexicana seed poisoning locally, and did not know that mustard oil poisoning (epidemic dropsy) was the same condition." There are, however, many references to epidemic dropsy, this *Bulletin*, 1939, v. 36, 905–911 ; 1940; v. 37, 747–751 ; 1941, v. 38, 288, 289, 606-608 ; 1942, v. 39, 339–342, 711–713 ; 1943, v. 140, 624 ; 1944, v. 41, 623, 708 ; 1946, v. 43, 953].

H. Harold Scott

STEYN, D. G. **Poisoning with the Seeds of** *Argemone mexicana* **(Mexican Poppy) in Human Beings. Indian Epidemic Dropsy in South Africa.** *South African Med. J.* 1950, May 6, v. 24, No. 18, 333–9, 2 figs. [36 refs.]

A most excellent account of the Mexican poppy, *Argemone mexicana*, the plant itself, its seeds, its toxicity as shown by experiments on animals and on human volunteers, the active toxic principles of the seeds (argemonine (protopine) and berberine) and the tests for them. Though all this is well known to readers of this *Bulletin* it is advantageous to have the information collected, as here, in a single article.

What is less well known is the treatment of the disease, epidemic dropsy, caused thereby, hence the particular value of that section of this article, for not only is the treatment detailed but, what is every whit as important—perhaps even more important—the rationale of the treatment : protection and restoration of damaged capillaries by rutin and vitamins, C, E, and P, liberally administered ; protection of the liver and stimulation of its detoxifying action by a diet rich in protein and low in fat, with glucose (5 oz. by mouth daily) and insulin (10 units twice daily), vitamins A, B complex (as brewers' yeast) and perhaps K, as the liver function is impaired. To replace calcium deficiency, 10 per cent. solution of Calcium-Sandoz intravenously or intramuscularly,

casein (which contains choline and methionine) to prevent fatty degeneration of the liver, and glutathione to assist the detoxifying processes of the liver, were prescribed.

It is a matter for wonder that cases of epidemic dropsy have not been more common in South Africa, for mill-owners are urged by the farmers "not to set the sieves too finely," in other words not to separate the weeds altogether, as the contaminated wheat is used for feeding poultry and the coloured workers. It is used also for their own consumption by the poor European and non-European wheat-growers. [See also the preceding abstract].

H. Harold Scott

DERMATOLOGY AND FUNGUS DISEASES

DE ALMEIDA, F., LACAZ, C. da S., RIBEIRO, D. O. & DE AZEVEDO, P. C. **Contribution to the Study of Mycetomae in São Paulo, Brazil. Madura Foot by "Cephalosporium Sp."** *Rev. Brasileira Biologia.* 1948, Oct., v. 8, No. 3, 287–96, 9 figs. [17 refs.]

"The authors report a third case of Madura foot by a fungus of the genus *Cephalosporium.* They show the possibility of a clinical differentiation between actinomycetomae and maduromycetomae on account of their etiologic agents bearing biological characteristics quite far apart from one another, i.e.: actinomycetomae are caused by *Actinomycetes*, while maduromycetomae are caused by *Eumycetes.*

"By reporting this case of mycetoma with all its related clinical, mycological and X-ray documentation, the authors wish to draw the dermatologist's attention to such an interesting type of mycosis which has a chronic development and almost always requires surgical treatment (preserving or mutilating surgery)."

CAMPINS, H., SCHARYJ, M. & GLUCK, Vera. Coccidioidomicosis (Enfermedad de Posadas). Su comprobación en Venezuela. [**Coccidioidomycosis (Posadas' Disease) proved in Venezuela.**] *Archivos Venezolanos de Patol. Trop. y Parasit. Méd.* 1949, Oct., v. 1, No. 2, 215–34, 7 figs. [11 refs.] English summary.

This is a report of the first case of coccidioidomycosis (*Coccidioides immitis*) identified in Venezuela. The patient, first seen on 1st April 1948, was a woman aged 60 living in the village of San Miguel in the State of Lara where the infection is presumed to have been contracted. The significant lesion was a granuloma on the back of the left hand which had been diagnosed as verrucose tuberculosis. Radiography showed chronic pulmonary lesions which were also ascribed to tuberculosis. The diagnosis of coccidioidomycosis was based on the identification of *Coccidioides immitis* in histological sections of the granuloma on the hand, and isolation of the fungus in culture from this lesion. A description is given of experimental infections of guineapigs with the culture. The coccidioidin skin test gave a ++ positive result at 1 : 100. The specific complement-fixation test gave a +++ positive result with serum at a dilution of 1 : 16, but the results of the serum precipitin test were negative at all serum dilutions, which would indicate an infection of some duration. Treatment, which was effective, consisted in extensive electro-coagulation of the lesion.

The village of San Miguel is situated at an elevation of 1,031 metres in an arid mountain area rising from an equally arid valley. The climate is dry and

the average temperature is 24°C. in the village and 27°C. in the valley. The climatic and geological conditions are not unlike those existing in the endemic areas of coccidioidomycosis in California and Argentina. *J. T. Duncan*

ROSENTHAL, S. R. & ELMORE, F. H. **Studies on the Contagiousness of Coccidioidomycosis. II. The Fate of Spherules in Sputum exposed out of Doors.** *Amer. Rev. Tuberculosis.* 1950, Jan., v. 61, No. 1, 95–105, 2 figs.

In the first report of this series, ROSENTHAL and ROUTIEN [this *Bulletin*, 1947, v. 44, 460], showed that guineapigs could be infected by the parasitic spherules of *Coccidioides immitis* when this form of the fungus, in pus or sputum, was introduced directly into the bronchial system ; and from this observation they concluded that, contrary to the generally accepted view, coccidioidomycosis may be transmitted from man to man by contagion. The opposite view is clearly presented by BASS *et al.* [this *Bulletin*, 1949, v. 46, 968].

The present authors point out that although the evidence is overwhelming that coccidioidomycosis is usually contracted by inhaling the fungus with the wind-borne desert dust of the endemic areas, it has never been shown that the form of the fungus inhaled is necessarily the chlamydospore of the saprophytic growth and not the parasitic spherule. They state that " there seems to be a general agreement that the fungus does not propagate in the soil, although it is disseminated in dust ", and, although *C. immitis* was isolated from desert soil by EMMONS (*Pub. Health Rep.* Wash. 1942, v. 57, 109) and others, the form of the fungus in the soil was not determined. Apparently the authors attribute prime importance to the natural infection of the desert rodents by *C. immitis*, shown by EMMONS and ASHBURN [*Bulletin of Hygiene*, 1943, v. 18, 385], and they consider that the parasitic spherules derived from the infected animals constitute the infective form of the fungus carried with the wind-borne dust. Many who dissent from this view will nevertheless admit that there are gaps in the epidemiological study of coccidioidomycosis which remain to be filled.

The experimental work described in the present paper consisted in exposing samples of sputum containing spherules of *C. immitis*, in closed containers under various conditions of light and temperature out of doors, to determine the viability of the spherules under these conditions and what changes may take place in them. Half the samples consisted of 10 ml. quantities of sputum mixed with an equal volume of earth, and the remainder of 10 ml. quantities of untreated sputum. Some of the containers, closed with caps of X-ray film, were exposed to direct sunlight and others were kept in the shade, while control samples were stored in the cold and in an incubator at 30°C. Observations made at intervals showed that germination of the spherules with formation of mycelium occurred in several of the samples, especially those mixed with earth and exposed to the sun's rays and those without earth and kept in the shade. Germination appeared after 24 to 48 hours and the mycelium was demonstrable up to 7 days and less frequently up to 15 or even 30 days. In only one sample were the saprophytic chlamydospores found. It would seem, therefore, that, although germination of the spherules occurred, the fungus could not continue to vegetate on the soil. It must be stated, however, that the soil used was collected at Santa Fé and not from an endemic area of coccidioidomycosis. Assuming that, contrary to the authors' opinion, *C. immitis* does vegetate on the desert soil of the endemic areas, its failure to grow on samples of other kinds of soil may provide an explanation of the strictly localized distribution of the infection, and it presents an additional indication of the need of further epidemiological research on the disease.

Cultures of *C. immitis* were obtained from the samples up to the 4th or 7th day, and more frequently from those mixed with earth and exposed to sunlight than from those without earth and kept in the shade. Only once was culture successful after 30 days' exposure although by animal inoculations the viable fungus was demonstrated a little longer.

Spherules, viable or not, were usually found in the samples throughout the whole experiment, but in one of the samples containing earth and exposed to sunlight the spherules apparently disappeared after the first 6 hours but reappeared after 30 days. This may be explained by assuming that undetected endospores developed in the sample and reached an easily detectable size in 30 days. This observation, if confirmed, would lend support to the authors' hypothesis of the rôle of the spherule in infection.

However the results of this experimental work may be interpreted, it is profoundly interesting and it should be continued and expanded.

J. T. Duncan

DE BARROS, O. M. Sur la maladie de Lutz, Splendore et Almeida, "Lutz' Disease." *Bull. Soc. Path. Exot.* 1950, v. 43, Nos. 1/2, 114–20, 7 figs. on 4 pls. [13 refs.]

Previous to 1938 paracoccidioidal granuloma (Lutz's disease) was almost essentially fatal, the treatment available being effective only with localized infections in the mouth. However, with the introduction of sulphonamide therapy cures have been obtained even in the severe generalized forms of the disease. The author stresses the need to use the drug in adequate dosage unless it is not tolerated, and to continue the treatment for several months under the control of blood leucocyte counts. Progress and extension of the disease during the early stages of treatment is not an indication to withhold or reduce the treatment. The results of treatment of four cases are described: (1) A man aged 62 suffering from extensive disease of the mouth and pharynx with marked dysphagia and involvement of both lungs. Sulphadiazine, 6 gm. daily, was administered for six weeks but was then discontinued, because of a renal complication, and "Trisulpha" (equal parts of sulphamerazine, sulphathiazole and sulphadiazine), 4 gm. daily, was substituted. Three months later there was marked amelioration of the symptoms with healing and cicatrization of the lesions. The treatment then reverted to sulphadiazine, 5 gm. daily, for three months and further courses with intermissions. (2) A man aged 50, with pulmonary and oral lesions, who had been treated irregularly with sulphadiazine over a period of seven years, was given sulphadiazine, 6 gm. daily, for three months, with excellent results. (3) A patient aged 28 with very severe bucco-pharyngeal and glandular disease, dysphagia and aphonia with progressive respiratory obstruction but no disease of the lungs. Treatment was commenced with 4 gm. of sulphadiazine daily but this was soon increased to 6 gm. daily. Except for temporary regressions caused by laryngeal obstruction which necessitated tracheotomy, and the development of an abscess in the inguinal region, improvement was continuous. After six months' treatment recovery was marked, with a sense of well-being and much gain in body weight. Treatment was prolonged, with intermissions, for another four months at 4 gm. daily. (4) This case, in a child aged 11, was unique in that, although the lesions were disseminated, only the bones were affected. Swelling, great disability and pain on pressure over the affected bones were marked signs. Among the bones affected were some of the cranial bones, both clavicles, some of the ribs, both tibiae, the right humerus which had a pathological fracture at its upper extremity, and both femora. The lesions were cystic, osteomyelitic and osteoclasic. Treatment with sulphadiazine, 3 gm. daily,

with immobilization of the fractured arm, was pursued for three months and, after a fortnight's interval, for another four months. The child made a good recovery. A warning is given that clinical cure may not imply sterilization of the infection.

It is interesting to notice that in two of the four cases the lungs were extensively involved and the author points out that, contrary to the commonly held view, pulmonary involvement in Lutz's disease is not rare, in fact, it probably occurs in more than 50 per cent. of the infections. *J. T. Duncan*

DE ALMEIDA, F. & LACAZ, C. da S. Blastomicose "tipo Jorge Lobo". [**Blastomycosis of the Jorge Lobo Type.**] *Folha Med.* 1950, Mar. 5, v. 31, No. 5, 36–40.

In 1931, Lobo described an unusual type of chronic blastomycosis of the skin in Brazil, which appeared to be different from Lutz's disease (South American blastomycosis). Histologically, the granuloma was found to be composed mainly of plasma cells (histiocytes ?), giant cells and fibroblasts and the causative fungus, present in these cells, sometimes had an hour-glass shape which suggested simple budding. A good description of the disease, under the name of Lobo's disease or benign blastomycotic granuloma, including its histopathological and mycological features, was given by DA FONSECA [this *Bulletin*, 1947, v. 44, 610]. He made a study of two fungi isolated at different times from cases of Lobo's disease, and one of these was named *Glenosporella loboi* da Fonseca and Leao 1940, and the other *Glenosporopsis amazonica* da Fonseca 1943. ARTAGAVEYTIA-ALLENDE and MONTEMAYOR [this *Bulletin*, 1950, v. 47, 493] from a study of the fungi of blastomycosis concluded that *Glenosporella loboi* was, in fact, *Paracoccidioides brasiliensis* and Lobo's disease merely a clinical variety of South American blastomycosis.

The present authors emphasize the clinical differences between Lobo's disease and the commoner form of blastomycosis, but they have confirmed the resemblance, morphologically and biochemically, of *Glenosporella loboi* to *Paracoccidioides brasiliensis* and of *Glenosporopsis amazonica* to *Paracoccidioides cerebriformis* or to the cerebriform type of *P. brasiliensis*. They suggest, apparently on the ground of its peculiar pathogenicity, that the species *loboi* should be retained and transferred to the genus *Paracoccidioides* as *Paracoccidioides loboi* n. comb. The statement on the other species, *G. amazonica*, is deferred to a future occasion. *J. T. Duncan*

COLBERT, J. W., Jr., STRAUSS, M. J. & GREEN, R. H. **The Treatment of Cutaneous Blastomycosis with Propamidine. A Preliminary Report.** *J. Investigative Dermat.* 1950, Feb., v. 14, No. 2, 71–3.

"The treatment of a case of cutaneous blastomycosis with propamidine is reported. Although complete healing has not occurred, a suggestively favorable clinical response has been noted. It is realized that further treatment is necessary before any definitive statement can be made. However, because of the prolonged follow-up required, the lack of other cases available, and the suggestive clinical response, a preliminary report appeared worth while."

MISCELLANEOUS DISEASES

LEE, J. G. **Experimental Lathyrism produced by Feeding Singletary Pea (*Lathyrus pusillus*) Seed.** *J. Nutrition.* 1950. Apr. 10, v. 40, No. 4, 587–94. [16 refs.]

"1. The ingestion of diets containing 70% Singletary pea (*Lathyrus pusillus*) seed meal leads to the development of the symptoms usually associated with lathyrism.

"2. A deficiency within the ration is not the cause. The peas contain some toxic substance.

"3. The toxicity is not due to the presence of an enzyme or toxic inorganic material.

"4. The feeding of alpha-tocopherol in large doses confers some protection against the paralysis. This is not due to an anti-oxidant effect within the digestive tract.

"5. Divicine is not the material present which is responsible for the skeletal and muscular changes."

GELFAND, M. **Tropical Myositis and Idiopathic Thrombophlebitis (Tropical Primary Phlebitis).** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950. Jan., v. 43, No. 4, 439–42, 1 fig.

The aetiology of tropical myositis is still obscure, though the disease has been ascribed to infection with *Staphylococcus aureus* or to filariae. The author thinks that in some cases it may arise as a sequel of tropical phlebitis, in which the inflammatory process in the vein, with thrombus formation, is often accompanied by arterial spasm, or even arteritis, and consequent interference with the blood supply. This might lead to liquefactive necrosis and abscess formation. He describes a case in a young African, in whom oedema of one thigh and leg, with fever, was followed by formation of an abscess on the posterior surface of the thigh, from which a pure growth of *Staph. aureus* was obtained. Investigation of the femoral vessels in Hunter's canal showed that the vein was thrombosed and necrotic in part.

The author does not claim that all cases of tropical myositis arise in this way, but he thinks that some of them may do so. *Charles Wilcocks*

SÉGUY, E. Introduction à l'étude des myiases. **Introduction to the Study of Myiasis.** *Rev. Brasileira Biologia.* 1948. Apr., v. 8, No. 1, 93–111. [28 refs.]

A general discussion and historical review.

HESSE, E. Eine Dipterenlarve in der Vorderkammer des Auges. **Diptera Larva in the Anterior Chamber of the Eye.** *Wien. klin. Wschr.* 1949. Oct. 21, v. 61, No. 42, 689–92, 4 figs. [13 refs.]

After general remarks on ocular myiasis the author describes the case of a boy of 12 years who had complained for several months of increasing inflammation of his right eye, with deterioration of vision. Examination with the slit-lamp revealed a "worm-like body" which moved on application of the light. It was found on removal to be segmented with 10 unequal segments and to measure 10·5 mm. in length and 1·3 mm. in thickness. It was identified as a larva of *Hypoderma bovis*. The author does not think that it gained entrance directly to the eye. The boy was engaged in looking after cattle and he said that "flies and horse-flies" were very troublesome. He, it is said, had scratches on his legs which would bleed and flies would settle there and it is

thought that the eggs deposited might gain entrance to the blood-stream and thus be transferred to other parts, in this instance the eye. *H. Harold Scott*

NIÑO, F. L. Consideraciones sobre miasis genital en la mujer. Dos nuevas observaciones de miasis por larvas de "Cochliomyia hominivorax" (Coquerel 1858). [**Genital Myiasis in Women. Two more Cases of Infestation by** *Cochliomyia hominivorax*.] *Prensa Méd. Argentina.* 1950 Feb. 3, v. 37, No. 5, 234–37, 8 figs. [17 refs.]

Of the two cases detailed, in one only was the localization genital; the other was infection of an operation wound in the neck. The author gives a list of 13 cases of genital infection, all in adult women except an adolescent of 15, and one of 16 with venereal papillomata. Including the one recorded in this paper 6 were infections of the labia majora, 2 of the labia minora, 3 in the region of the clitoris, one at the urinary meatus and one of the uterus. All had ulcers or leucorrhoea. Nothing is said about treatment, but the evolution column of the table presented gives all as "cured." *H. Harold Scott*

GAMBINI, G. Su un caso di "Larva migrans" e sui benefici risultati ottenuti con Antimoniato di N Metilglucamina. [**A Case of "Larva migrans" successfully treated with Glucantim.**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1950, Jan., v. 31, No. 1, 57–65, 4 figs. [38 refs.] English summary (3 lines).

The patient was an aviator, aged 45, who was accustomed to travel between Italy and Brazil and the Argentine. About 40 days before he came under the author's observation, when he was in Port Natal, Brazil, he had rested on the shore, sunbathing after a swim in the sea. Cattle were feeding close by him. The next day he observed red rounded spots about 4 cm. in diameter on the buttock, the lumbar region, around the umbilicus and on the right breast; they itched greatly. During the next 2 days these spots became bright red, tortuous lines; the itching caused him to scratch and a serous bloodstained exudation resulted. Repodral and iodine in alcohol locally were ineffectual in giving relief and on his return to Italy there were seen the lesions of a migrating larva up to 18 cm. in length and 1–2 mm. in breadth and the marks of scratches. Search for the larvae, as by "applying oils to make the skin transparent" was barren of result, but the diagnosis, based on the history, was infection by *Ancylostoma brasiliense*. Intradermal injection of 30 per cent. N methylglucamine antimoniate, or Glucantim, 1 cc. in each site affected, at the end of the canal, every fourth day, was made. Two of the lesions were cured after the first treatment, the others after the second; there remained some degree of pruritus, but that too ceased after the third infiltration and in 20 days cure was complete and when the patient was seen again 4 months later there had been no return of symptoms. *H. Harold Scott*

PROTOZOOLOGY: GENERAL

SANGIORGI, G. Toxoplasmas y toxoplasmosis. [**Toxoplasms and Toxoplasmosis.**] *An. Med. Publica.* Santa Fe, Argentina. 1949, Sept., v. 1, Nos. 2/3, 409–17.

This is a review of our present knowledge of animal and human toxoplasmosis. *C. A. Hoare*

WINSSER, J. & MAKSTENIEKS, O. Een nieuwe serologische methode voor de diagnostiek van toxoplasmosis. [**A New Serological Method for the Diagnosis of Toxoplasmosis.**] *Nederl. Tijdschr. v. Geneesk.* 1949, Oct 22, v. 93 (iv), No. 43, 3630–40. [Refs. in footnotes.] English summary.

—— & ——. **Newer Diagnostic Procedures in Toxoplasmosis.** *Antonie van Leeuwenhoek: J. Microbiol. & Serol.* 1949, v. 15, No. 2, 118–24.

The Dutch and English papers are two versions of the same subject and can, therefore, be reviewed together.

Until recently the most widely used serological test for the diagnosis of toxoplasmosis was SABIN and OLITSKY's "rabbit skin test" (*Science*, 1937, Apr. 2, 336). However, this method has a number of drawbacks, to which the authors draw attention. A more simple and rapid diagnostic method is SABIN and FELDMAN's new dye test (*Science*, 1948, Dec. 10, 660), in which the peritoneal exudate of mice, infected 3–4 days previously with toxoplasms, is mixed with fresh human serum and put in a water bath at 37°C. for one hour, after which a loopful of the fluid is placed on a slide, mixed with an alkaline methylene blue solution, and the parasites are examined microscopically. If the serum contains toxoplasm antibodies, the cytoplasm of the parasites remains unstained, but if the serum is normal, it will stain a deep purple blue. The specific antibody is thermostable, but the immunity reaction in the dye test can only be completed in the presence of a thermolabile factor, the activator, present in normal human serum.

The authors have modified the dye test, using the following procedure. In tube 1 are placed 2 drops of undiluted non-inactivated patient's serum, 4 drops of activator serum and 2 drops of toxoplasm suspension (peritoneal exudate of mouse with 1–2 drops of 1 : 100 heparin solution). Tubes 2 and 3 each contain 2 drops of patient's serum, to which activator serum is added to make dilutions of 1 : 5 and 1 : 25 respectively, while the other components are as in tube 1. The end dilutions of the patient's serum, before they are placed in a water bath, are 1 : 4, 1 : 20, 1 : 100. Tube 4 contains 4 drops of activator serum plus 4 drops of toxoplasm suspension; tube 5 (control) contains 4 drops Tyrode solution plus 4 drops of toxoplasm suspension.

The tubes were placed in a water bath at 37°C., after which 4 drops of alkaline methylene blue were added to each tube. The fluid was examined for toxoplasms immediately afterwards and next day after storage in a refrigerator.

Using this dye test, the authors examined the sera of 68 patients, some of which had previously been examined by the rabbit skin test. The results, which are shown in a table, were very satisfactory. Some of the patients were also examined by Frenkel's intradermal toxoplasmin test, with less satisfactory results, though it may be of some diagnostic value when toxoplasms are not available.

The authors consider that the dye test is especially valuable for confirming a clinical diagnosis of toxoplasmosis, but when used alone the results are inconclusive and its value is therefore limited. *C. A. Hoare*

STOPPELMAN, M. R. H. & BLAAUW-VAN DOK, S. Toxoplasmosis met afwijkingen in de functie van het beenmerg. [**Toxoplasmosis with Bone Marrow Dysfunction.**] *Nederl. Tijdschr. v. Geneesk.* 1950, May 13, v. 94 (ii), No. 19, 1374–6.

The English summary appended to the paper is as follows:—

"Discussion of a case of congenital toxoplasmosis accompanied by leucopenia and thrombopenia. The question whether toxoplasmatic infection has

anything to do with anomalies in the function of the marrow bone, is not touched upon."

VAN THIEL, P. H. De therapie van experimentele toxoplasmosis met enkele sulfonamides, arseenverbindingen en antimalariamiddelen. [**Treatment of Experimental Toxoplasmosis with Sulphonamides, Arsenicals and Antimalarial Drugs.**] *Nederl. Tijdschr. v. Geneesk.* 1949, Nov. 5, v. 93 (iv), No. 45, 3818–20. English summary (6 lines).

The English summary appended to the paper is as follows :—

"Study on the influence of several sulfonamides, arsenic compositions and antimalaria drugs on experimental toxoplasmosis. Only the sulfonamides, viz. the three pyrimidins percocoid, sulfamezathin and sulfadiazin gave good results. The author recommends parenteral injections with percocoid in human cases. In mice after treatment complete recovery or a state of infection immunity were seen."

ENTOMOLOGY AND INSECTICIDES: GENERAL

BISHOPP, F. C. **Relationship of Insects to Disease.** *Soap.* New York. 1950, Apr. & May, v. 26, Nos. 4 & 5, 129–35, 147; 141–5, 175.

PAL, R. **The Wetting of Insect Cuticle.** *Bull. Entom. Res.* 1950, May, v. 41, Pt. 1, 121–39, 5 figs. on pl., 7 text figs. [29 refs.]

GARRETT-JONES, C. **The Growth of a Maggot on Sterile Blood.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 545–6.

The author has succeeded in feeding second stage larvae of the Congo floor maggot (*Auchmeromyia luteola*) on freely exposed sterile blood (human, rabbit or horse). A small amount of citrated or defibrinated blood is placed on filter paper and offered to the maggot at an incubation temperature of 29°C. The Congo floor maggot feeds by making a wound in the host's skin with its mouth hooks and sucking the exuded blood directly into its pharynx. Its behaviour is therefore comparable with that of the larvae of *Lucilia* and *Calliphora* when the latter two are offered blood.

J. H. Sudd

RICCIARDI, I. Sôbre a marcação negra basal do 2.° tarso posterior do "Anopheles (Nyssorhynchus) darlingi" e do "Anopheles (Nyssorhynchus) argyritarsis". **Black Marking on the Base of the Second Posterior Tarsus of *Anopheles darlingi* and *A. argyritarsis*.** [*Rev. Brasileira Biologia.* 1948, Dec., v. 8, No. 4, 535–8.

PEREIRA BARRETTO, M. & PESSÔA, S. B. Contribuição para o estudo da distribuição geográfica dos flebótomos americanos (Diptera : Psychodidae). **Contribution to the Study of the Geographical Distribution of the American *Phlebotomus*.** [*Livro Homen. Ferreira d'Almeida.* São Paulo. 1946, pp. 77–101, 1 map. 10 refs.] Summary taken from *Rev. Applied Entom.* Ser. B. 1950, Mar., v. 38, Pt. 3, 45–6.]

The author gives a list of 136 species of *Phlebotomus* considered valid (or probably valid) that have been recorded from the American continent and Trinidad, with their local distribution there and in some cases synonyms, followed by lists of the species that occur in the Nearctic region and the various subregions of the Neotropical region, showing which are peculiar to each and which have a more extended distribution.

FOX, I. & KOHLER, C. E. **Distribution and Relative Abundance of the Species of Biting Midges or *Culicoides* in Eastern Puerto Rico, as shown by Light Traps.** *Puerto Rico J. Pub. Health & Trop. Med.* 1950, Mar., v. 25, No. 3, 342–9, 1 map. [15 refs.] [Spanish version 350–58].

Records are given of nine species of *Culicoides* collected in Porto Rico, captured mainly by the systematic use of light traps. In many of the collecting areas malaria control operations with DDT larvicidal and residual sprays were in progress, but these did not apparently influence the midge population.

C. inamollae, a species described only recently, comprised 61 per cent. of the total collection of over 41,000 specimens and was dominant in nine out of twelve localities. *C. furens* formed 30 per cent. of the total and predominated in the remaining three localities. *C. pusillus*, not formerly recorded from Porto Rico, made up 5·8 per cent. of the total and was found in most localities. *C. guttatus* occurred everywhere, but in small numbers only. *C. loughnani jamaicensis* and *C. phlebotomus* were also recorded.

Two species, *C. trilineatus* and *C. borinqueni*, were caught only in tree holes and *C. hoffmani* was found quite commonly in tree holes but only rarely in traps. The authors consider that light traps do not give a wholly reliable picture of the fauna owing to the varying response of *Culicoides* to light and other extrinsic factors, but that results obtained by this method are nevertheless of interest. *M. T. Gillies*

ROCHE, P. J. L. **Keys for the Identification of the Nigerian Tabanidae.** 16 pp., 1 fig. Lagos : Govt. Printer.

The present pamphlet is written for the use of those who have a limited knowledge of entomology, but wish to learn more about the Tabanid flies of Nigeria. It consists of a brief introduction, a key to the seven genera known to occur and keys to the species occurring in each genus, together with locality records from inside Nigeria. A total of 61 species is at present known : if we make no mistake, this number will be rapidly increased because of the existence of the present work. The key is adapted from those published by authorities on the subject and appears to be a thorough piece of work though we have not actually subjected it to a practical test. *P. A. Buxton*

COLE, M. M. & SMITH, C. N. **Tick Repellent Investigations at Bull's Island, S.C., 1948.** *J. Econom. Entom.* 1949, Dec., v. 42, No. 6, 880–83.

Tests were carried out on the efficiency of thirty-seven compounds with emulsions of which twill fatigue suits were impregnated. The work parallels and largely confirms that of SMITH and KING (this *Bulletin*, 1950, v. 47, 670). The efficiency of the following compounds is confirmed :—

Safe on skin or clothing :—Hexyl mandelate, Indalone, Dimethyl carbate, 2-butyl 2-ethyl 1-3 propanediol, 2-phenoxyethyl isobutyrate.

Safe on clothing, not on skin :—N-butyl acetanilide, 2-(2-(2-ethylhexyloxy) ethoxy)ethanol.

The following compounds are added to the list of Smith *et al.* and King :—ethyl *beta*-phenylhydracrylate—safe on skin or clothing. N-amyl-*alpha*-butoxyacetamide and 2-(2-hexylexyethoxy)ethanol are of unknown toxicity. *J. H. Sudd*

CROSS, H. F. & FYE, R. **The Use of Sleeves for evaluating Acaricides as Clothing Treatments.** *J. Econom. Entom.* 1949, Dec., v. 42, No. 6, 878–80.

Because the amount of an acaricide needed to test its efficiency for treating clothes as a protection against Trombiculid mites is large, detached jacket sleeves have been used. These were impregnated with the compound to be tested. Apart from the comparatively small amount of a compound which is needed for such a test, the method has the advantage that a subject may test a different acaricide on each arm or that one arm may bear an untreated sleeve as a control. Sleeves and uniforms were impregnated with ten test materials and with benzyl benzoate, the latter being a standard for comparison. The efficiency of the acaricides was tested after several successive washings and after both washings and "ageing" (exposure to ultra-violet light).

The sleeves were worn by volunteers, who each introduced 100 Trombiculid mites under each sleeve on 2 consecutive days. The percentage of protection was calculated by the following formula :—

$$=100-\frac{\text{Number attached to subjects wearing treated garments}\times 100}{\text{Number attached to subjects wearing untreated garments}}$$

With a few exceptions, impregnated sleeves retained their efficiency after more washing than did uniforms impregnated with the same substance. The exceptions were sleeves treated with benzyl benzoate, dichlorodiphenyl ether and *x*-trichlorodiphenyl ether. Benzyl benzoate, technical BHC (10 per cent. gamma isomer), phenyl benzoate and *x*-trichlorodiphenyl ether proved inferior to the other compounds on both sleeves and uniforms. Dichlorodiphenyl ether was inferior only on sleeves. In the same way, five of the most effective acaricides in sleeve tests were among the most effective when tested on uniforms. The resistance of acaricides on sleeves to U.V. light was similar to that when they were tested on uniforms in U.V. light or were subjected to outdoor ageing.

J. H. Sudd

DAVID, W. A. L. & GARDINER, B. O. C. **Factors influencing the Action of Dust Insecticides.** *Bull. Entom. Res.* 1950, May, v. 41, Pt. 1, 1–61, 22 figs. [66 refs.]

SUN, Yun-Pei. **Toxicity Index—an Improved Method of comparing the relative Toxicity of Insecticides.** *J. Econom. Entom.* 1950, Feb., v. 43, No. 1, 45–53. [12 refs.]

The "toxicity index" referred to is simply the inverse ratio of median lethal concentrations multiplied by 100 ; thus any new insecticide can be referred to a desired standard for which the toxicity index is taken to be 100. The author quotes a variety of results obtained by spraying houseflies with insecticides in a wind tunnel. Various modifications of the conditions (dosage, fineness of spray, age of flies, etc.) were found to affect the results of various groups of insecticides in the same way ; therefore the "toxicity indices" remained approximately constant.

The author quotes some results which indicate the relative toxicity to houseflies of a number of new insecticides. Thus, taking technical chlordan as a standard, the toxicity indices in the case of the N.A.I.D.M. 1948 strain of housefly are as follows :—

Dieldrin 657 ; *Gamma* BHC 480 ; Aldrin 317 ; *Beta*-chlordan 189 ; Rotenone 123 ; pp′ DDT 66 ; Pyrethrins 52 ; *Alpha*-chlordan 40 ; Toxaphene 23.

Dieldrin and Aldrin are two new synthetic insecticides, produced, like chlordan, by a Diels-Alder condensation. It will be noted that they are highly effective towards houseflies.

J. R. Busvine

INCHO, H. H. & DEONIER, C. C. **Comparative Toxicity of Benzene Hexachloride, DDT, and Pyrethrum to Mosquito Larvae.** *Mosquito News.* 1950, Mar., v. 10, No. 1, 6–8.

This paper gives the results of experiments made to compare the effectiveness of benzene hexachloride, DDT and pyrethrins against anopheline and culicine mosquito larvae. The toxicities to *Anopheles quadrimaculatus* larvae of acetone-water suspensions of crude benzene hexachloride and its *alpha, beta, delta* and *gamma* isomers, DDT and the pyrethrins were observed. Of the four isomers of benzene hexachloride only the *gamma* isomer showed considerable toxicity, which was approximately half that of DDT, while the pyrethrins were approximately only half as toxic as the *gamma* isomer.

DDT, *gamma* benzene hexachloride, and pyrethrins in No. 2 fuel oil were applied to the surface of the water and the toxicity to various mosquito larvae was studied. The order of toxicity towards *Anopheles quadrimaculatus* was DDT > Pyrethrum > γBHC. With *Culex quinquefasciatus* [*fatigans*] the order was Pyrethrum ≏γBHC > DDT ; with *Aëdes aegypti* the order was DDT > Pyrethrum ≏γBHC. There was considerable difference in resistance of the different larvae, *Culex quinquefasciatus* showing the lowest mortality and *Anopheles quadrimaculatus* the highest at a given concentration.

It was found that a dust of the crude benzene hexachloride containing about 12 per cent. of the *gamma* isomer killed 70 per cent. of the *Anopheles quadrimaculatus* larvae, when applied by sifting through a fine-mesh screen on to the water, at a dosage of 1/40 pound per acre. *Thomas E. Fletcher*

FIELD, J. W. **Fumigant and Repellent Effects of BHC (Gammexane) and DDT upon Anopheles.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1950, Mar., v. 43, No. 5, 547–8.

The experiments were done in a laboratory, in Malaya, with the use of *Anopheles vagus.* The method was to count the numbers of mosquitoes resting on one gauze side of a small cage containing about fifty adults of this species. A plywood panel, treated with the substance under test, was then brought up to one inch of the side of the cage and left there for fifteen minutes. The numbers remaining on the relevant side were then recounted. This test was conducted simultaneously with two cages, one with a treated and the other with an untreated panel. After the experiment the insects were left for twenty-four hours and then inspected for mortality.

Tests were made as follows :—Four with DDT at 200 mgm./sq. ft. as wettable powder and one with 400 mgm. DDT/sq. ft. applied in benzene ; two with *gamma* BHC (40 mgm./sq. ft. as wettable powder and 80 mgm./sq. ft. in benzene) ; one with Citronella at 1 ml./sq. ft. ; and nine control tests.

	Results :			
	DDT	BHC	Citronella	Control
Ratio : Resting at start/resting at end on experimental side ...	0·79	0·33	0·22	1·02
Per cent. dead after 24 hours ...	48	81	7	6

All three treatments caused significant repellence and DDT and *gamma* BHC also caused a significant mortality.

[The reviewer was so struck with this remarkable action of DDT at a distance that he sent some pure pp′ DDT (M.p. 108·4–108·8°C.) to Mr. Reid (whose

tests the author reports). The experiments were repeated and it was found that the action at a distance was only obtained with some commercial grades of DDT and not with the pure sample. The results reported above may, nevertheless, be important, for the pure compound is unlikely to be used for house-spraying against mosquitoes.] *J. R. Busvine*

HORSFALL, W. R. **Influence of Environment on the Distribution of Thermal Aerosols Toxic to Mosquitoes.** *J. Econom. Entom.* 1950, Feb., v. 43, No. 1, 37–40.

In parts of America, urban districts are sometimes invaded by swarms of mosquitoes, breeding at a distance from the town ; for example, a suburb of Chicago suffers from incursions of *Aëdes vexans*. Attempts have been made to control the nuisance by DDT aerosol produced by a thermal generator (Todd Insecticide Fog Applicator). Thus in summer 1949, in the Chicago suburb mentioned, several thousands of pounds of DDT were released as aerosols over an area of 30 square miles. The results were very inconsistent and therefore experiments were done with caged mosquitoes (*Culex pipiens* and *C. restuans*, both laboratory-reared).

The aerosol (5 per cent. DDT in Diesel oil) was generated at the rate of 3 to 4 quarts per minute from a generator on a carrier which could be moved about at 5 to 15 m.p.h., usually perpendicular to the wind. The effects of the aerosol were judged from mortality caused in caged insects exposed 150 to 200 feet away from the generator. With a uniform fog produced by a stationary generator, 95 per cent. of the mosquitoes were killed by an exposure of 5 seconds. With a moving generator, no difference was noted in the uniformity of mists produced within the speed limits of 5 to 15 m.p.h. In a calm atmosphere, fogs of smaller droplets were more effective than those of larger ones. With the larger droplets, much better results were obtained when a 3 m.p.h. wind drifted the fog down to the cages than with very little wind (0·7 m.p.h.). Experiments with obstructions showed that even a small grass barrier (18 inches high and 4 feet wide) markedly protected the mosquitoes ; and when the cages were put into the middle of the grass barrier the kill was reduced even further. *J. R. Busvine*

PERRY, W. J. & BODENLOS, L. J. **2, 2-Bis (p-Chlorophenyl)-1, 1, 1-Trichloroethane (DDT) Determinations in Tissues, Body Fluids and Excreta of Human Subjects.** *Mosquito News.* 1950, Mar., v. 10, No. 1, 1–3.

No chemical detectable quantities of DDT were found in biopsies of fat from several persons who had had prolonged contact with the insecticide.

MCBRIDE, O. C., SULLIVAN, W. N. & FULTON, R. A. **Treatment of Airplanes to prevent the Transportation of Insects.** *J. Econom. Entom.* 1950, Feb., v. 43, No. 1, 66–70, 3 figs.

The experiments were done with a wide range (over 50 spp.) of insects including pests of agricultural and domestic and medical importance. (The most resistant were cockroaches and certain beetles ; the most susceptible were flies and mosquitoes.) Tests were conducted in the laboratory and extended to actual aircraft, both on the ground and in flight.

The residual treatments were applied in a mixture of volatile solvents, propelled by carbon dioxide at 150 lb. per sq. inch, from a 2·5 gallon per hour 80° oil-burner nozzle. One of the most promising formulae was (percentages) :—DDT, 10 ; dichlor-difluor-methane 20 ; piperonyl butoxide, 5 ; pyrethrum (20 per cent. conc.), 5. This was applied at about 75 mgm. per sq. ft.

Of the aerosols, one with the following percentage formula was most satisfactory :—DDT, 3 ; pyrethrum concentrate, 5 ; piperonyl butoxide, 2 (dispersed by Freon). A formula containing *gamma* BHC was more effective but said to be irritating. The aerosols were used at 20–30 gm. for 1,000 cu. ft. with an exposure period of 10 minutes.

The residual deposits alone, gave high kills after an exposure of one hour, especially after a double treatment (2 × 75 mgm. /sq. ft.). The mortalities of flies and mosquitoes were 90 to 100 per cent. ; and for all insects the figure was at least 86 per cent. The best results were obtained by combined residual and aerosol treatments which gave 97 to 99 per cent. kill.

It was noticed that repeated applications of aerosol built up residual deposits on horizontal surfaces, so that after 5 treatments there was nearly 100 mgm. per sq. ft. deposit and after 20 treatments, about 350 mgm. per sq. ft.

J. R. Busvine

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

MACDONALD, G. **James Forrest Lecture, 1949. The Interdependence of Medical Science and Engineering, with special reference to Public Health.** Ross Institute Industrial Advisory Committee (WIGGLESWORTH, A., Chairman). London School of Hygiene and Tropical Medicine, Information and Advisory Service. 1950, Jan., Bull. No. 3. Reprinted from *J. Inst. Civil Engineers*, Session 1948–1949. pp. 398–416, 5 figs. (1 folding) (17 refs.).]

"Co-operation between engineer and doctor can change the face of Africa to the Africans', and our, great benefit." On this theme the author based his discourse to an audience of engineers, citing Ceylon and Egypt as countries in which medical disaster has followed superb engineering work, and the United States, where disastrous results are being avoided.

Ceylon in the past was a land of great engineering success and until recently of medical failure. Until the introduction of malaria sometime about the thirteenth century, prosperity throughout the island was dependent on the perfection of its water storage and irrigation system. Thereafter a large part of the country (the dry zone) was depopulated and remained so until medicine entered the field ; the population has trebled itself in the last 75 years to reach 6,333,000 in 1946, an increase of 17 per cent. during the years of the recent war. The engineer created Ceylon, malaria destroyed it, the engineer and doctor must co-operate to restore it.

In Egypt the engineer controlled the flood waters of the Nile, thereby substituting perennial for occasional irrigation, and making two crops a year possible ; but these very measures, which improved man's environment, produced greatly improved conditions for the common water snail. As a result the already present schistosomiasis increased enormously in incidence among the peasantry.

In relation to the United States the author quotes the well-known water control measures which operate to prevent malaria in the Tennessee Valley scheme. In the Missouri Valley the impounding of water may improve the breeding facilities for a culicine mosquito, *Culex tarsalis*, which can be the vector of equine encephalitis. The problem is being studied by the engineers and scientists with special knowledge of the animals, birds and insects involved before the engineering works are put into effect.

In large tracts of Central Africa presence or absence of a permanent domestic water supply in the form of comparatively shallow ground water, within the

reach of primitive tools and skill, determines the distribution of population. The tsetse fly, apart from sleeping sickness in man, closes enormous areas of Africa to stock raising, which means an absence of meat and dairy products as food and an absence of animals for field cultivation. The main requirements of utilization of waste areas are the provision of surface water, clearance of bush and the settlement of people, all largely matters of engineering and administration. In irrigation schemes the lessons of Ceylon, Egypt and the Tennessee Valley must not be forgotten. The malaria potentialities are more dangerous than in the United States and schistosomiasis is already rife from Egypt to Natal. Again the preliminary and continuous co-operation of engineer, doctor and administrator is of vital importance.

In conclusion the author describes in brief the development in Britain of industrial medicine, industrial physiology and industrial psychology, or the study of the interaction of the worker and his working conditions.

R. Ford Tredre

MACKIE, T. T. & SONNENBERG, Bessie. **Tropical Disease Problems among Veterans of World War II.** *Amer. J. Trop. Med.* 1949, July, v. 29, No. 4, 443–51.

World War I dramatically emphasized the dangers of warfare in the tropics, and the experience thus gained served as a warning. However, World War II presented far greater and more varied problems, since so many tropical areas were concerned. The effectiveness of the planning to counteract the dangers of service in the tropics is demonstrated by the relatively low incidence of hospital admissions for tropical infections in the U.S. Armed Forces. A table giving "incomplete data" on this subject includes 756,849 admissions for dysentery or diarrhoea, 572,950 for malaria, 191,574 for infectious hepatitis, 134,242 for dengue or sandfly fever, 19,943 for hookworm, 13,009 for filariasis (Bancroft's), 7,421 for scrub typhus, 4,504 for amoebic dysentery [it is not clear if this figure is included in the first figures], 1,672 for schistosomiasis, and figures below this for typhus, endemic (893) and epidemic (63), leishmaniasis (361), relapsing fever (239), smallpox (125), cholera (14), and trypanosomiasis (5).

These figures do not, however, reflect the true incidence or morbidity of tropical infections, which is better shown in the high incidence of parasitization in several groups of returned military and naval personnel, *e.g.* marines from Leyte (34·1 per cent.) and ex-prisoners-of-war from the Far East (76 per cent.) already reported. The present study of war veterans was undertaken to supplement these figures.

A total of something over 500 veterans have been examined in the Tropical Disease Clinic of the Regional Office of the Veterans Administration, Winston-Salem, N.C., in the past eighteen months.

Of 484 examined for intestinal protozoal and helminthic infections, 309 (63·8 per cent.) have yielded positive findings. Of these, 191 (39·4 per cent.) have had infections by *E. histolytica*. With very few exceptions these infections have been accompanied by significant symptoms and disability.

Of 85 patients examined for malaria, 14 showed *Plasmodium vivax* infections. Only very rarely were there significant degrees of splenomegaly or anaemia, but in the majority a further examination revealed other undiagnosed infections, especially amoebiasis and hookworm which were probably the causes of the chronic disabilities.

Of 12 patients examined for filariasis, 10 showed a positive skin reaction with *Dirofilaria* antigen; none had elephantiasis or showed microfilariae in the peripheral blood.

Forty-seven (9·7 per cent.) were found to have hookworm infestation. Only one instance of actual hookworm disease was observed. In several others, however, the patient complained of epigastric pain and discomfort at times suggestive but not entirely typical of duodenal ulcer. In the limited number of these patients whom it was possible to treat effectively, adult forms of *Ancylostoma duodenale* were recovered.

Ten infestations with *Strongyloides stercoralis* and three with *Schistosoma japonicum* were found.

" The most striking fact has been the almost invariable failure of the veteran to obtain an accurate diagnosis in advance of the investigation in the Clinic. Of perhaps equal importance is the frequency with which the diagnosis of record has been psychoneurosis.

" The findings of this study made of a selected group of veterans emphatically indicates the necessity for a competent survey to determine the actual importance of chronic tropical and parasitic infections among the total veteran population of the country.

" The lack of adequately trained clinicians and laboratory technicians in tropical medicine and medical parasitology is reflected in the problems of many veterans and in the ultimate costs to the taxpayers." *L. E. Napier*

GIRDWOOD, R. H. **The Burma Campaigns—1942–1945. Clinical Aspects.** *J. Roy. Army Med. Corps.* 1950, Jan., v. 94, No. 1, 1–20, 1 fig. [55 refs.]

The author gives tabulated data collected at an Indian General Hospital at Nasik in July and August, 1944, at an Indian General Hospital at Sirajgunj in December, 1944 and January, 1945, and at a British General Hospital in Burma in September, 1945. All the patients were British soldiers. The Nasik cases were mostly men who had seen no fighting in the India-Burma area, the Sirajgunj group were mostly passing through after jungle fighting in the Assam-Burma area and the Burma group were returned prisoners of war, mostly from Thailand. The two former groups are considered together.

Of 242 patients admitted for fever, 125 were diagnosed as malaria by the finding of parasites and 31 as clinical malaria or pyrexia of unknown origin, with only 16 due to other causes, in the Nasik group ; whereas in the Sirajgunj group, 18 were diagnosed as malaria alone, 24 as scrub typhus alone, and 19 as scrub typhus with malaria, and 4 as malaria with some other conditions, out of a total of 70 cases.

In the Nasik group, in 79, 9 and 4 cases benign tertian parasites were found on the first, second and third days respectively, whereas in malignant tertian infections the parasites were found on the first day in 23 of 24 cases. The spleen was palpable in 51 out of 119 cases, and the liver in 13 ; there was little difference between the malignant and benign tertian cases, or between first and subsequent attacks.

For the diagnosis of scrub typhus a 1-in-250 *Proteus OXK* agglutination was accepted as evidence if the clinical features were consistent.

Of the bowel complaints the commonest were the dysenteries and sprue. The average number of stools passed daily at the time of admission was over ten in bacillary dysentery compared with under six in amoebic dysentery. In bacillary dysentery, 17 out of 20 stools were described as watery compared with 4 out of 17 in amoebic. The temperature rose above 99°F. in one case of amoebic and in 12 cases in bacillary dysentery.

There were 180 released European prisoners of war. Malaria was the commonest disease from which they had suffered ; 154 men stated that they

had had numerous attacks, as many as 40 or 50 in some cases. Among the other conditions from which they had suffered were oedema (62 attacks), pellagra (49), dysentery, probably bacillary (40), dysentery, probably amoebic (26), dysentery, uncertain type (20), diarrhoea (23), dry beriberi (34), dengue (33), jaundice (31), scrotal dermatitis (22) and cholera (7). Other conditions were recorded as occurring less than six times each.

At the time of examination, 77 suffered from amblyopia. In most cases there were central scotomata and 27 eyes showed optic atrophy. The vision of the 154 eyes was 6/60 or less in 74 eyes and less than 1/60 in 11.

Other clinical observations in these cases included partial nerve deafness (in 5 cases), atrophy of the tongue with fissures (18), angular stomatitis (20), palpable liver (13), and palpable spleen (13).

Blood examinations of 100 released prisoners showed means of 15·216 grammes of haemoglobin per 100 ml. and 4·861 million red cells per cmm.

L. E. Napier

HACKETT, C. J. **The Modern Medical Museum.** Reprinted from *Bull. Internat. Ass. Med. Museums.* 1949, Nov., No. 30, 114–29, 4 figs. [12 refs.]

Many readers will recall the attractive and valuable little book, *The Medical Museum*, produced some 20 years ago by the late Dr. DAUKES of the Wellcome Museum of Medical Science [this *Bulletin*, 1929, v. 26, 953]. The present Director has brought the information up to date and in addition has presented many thoughtful observations on the organization of medical museums in general. Dr. Hackett rightly calls attention to the need for improvement in the standards of medical museums, so indispensable to medical teaching: and the thought which has been devoted to the aim of obtaining the best results is evident in the number of expert opinions he has sought on lay-out and arrangement, lighting, heating, ventilation, optics and the like.

In describing the arrangement of the illustrations, summaries, specimens and models which comprise the contents of the Museum, the author gives much structural detail, including exact measurements of panels, shelves and screens and their height from ground level—information not easily obtained elsewhere by those contemplating the construction of a museum. Special attention is paid to the optimal level for close inspection of the material, which appears to lie between 40 and 70 inches from the floor; examples of layout are shown in three useful photographs and a small diagram.

Dr. Hackett points out the twin dangers of over-simplification and over-concentration in presenting material: the methods employed in the Museum to avoid them are clearly described. In connexion with printed material taken or copied direct from publications, a salutary warning is given regarding copyright.

Summaries and abstract files are described and the author sets out the ten headings into which summaries are divided in relation to the diseases to which they refer.

Brief notes are given on screens, models and viewing turrets, furniture, preservation and mounting of material and other miscellaneous items.

In discussing the future of the Museum, the author points to the need for a survey of the medical museums in Britain so that the best features of each may be embodied in schemes for medical museums fulfilling particular purposes. He also suggests that there might well then emerge a Medical Museum Bureau, which, in association with the medical schools would "assist in the provision of summaries, illustrative material such as photographs, diagrams, and charts, pathological and other specimens to medical schools for use in museums and

at lectures and demonstrations". Such a Bureau might also encourage research and development in museum technology and training of staff, in collaboration with appropriate national and international institutions.

Dr. Hackett observes that full use of our medical museums is not yet being made. Wherever the fault for that may lie it is certainly not with the admirable museum which he describes in this monograph: and those who may consider embarking on the somewhat formidable venture of building up an adequate medical museum, or of improving an existing one, will find their burden lightened and the task itself enriched, by having recourse to this pleasant, informative and eminently practical article. [Readers are reminded that specimens, illustrations and other suitable material are greatly welcomed at the Museum. They should be addressed to the Director, Wellcome Museum of Medical Science, 183–193 Euston Road, London, N.W.1.]

H. J. O'D. Burke-Gaffney

SIMPSON, G. G. **The Principles of Classification and a Classification of Mammals.** *Bull. Amer. Museum Nat. History.* New York. 1945, v. 85, xvi+350.

The second part of this bulletin gives the author's detailed classification of the mammalia. The system he adopts is a rather elaborate one with a very large number of grades in the hierarchy: for some purposes one could legitimately reduce the number of grades so as to simplify the general structure. The classification goes down to and includes genera of living and fossil mammals. It may be of considerable value to some of our readers as giving a standard arrangement likely to be accepted for a considerable number of years: for instance the worker may find himself involved in the rather formal question of which genera of rodents are recognized, and how they are related to one another; or what would be an accepted classification of African monkeys, or antelopes. The mammals are only on the edge of our subject, but they approach it on several sides.

The other parts of the work, that is to say the first and third, are less likely to be of general interest. They deal with the general principles which should guide one in drawing up a classification, and review the taxonomy of mammals with special reference to certain orders and families. *P. A. Buxton*

MACKERRAS, I. M. **Alfred Jefferis Turner and Amateur Entomology in Australia.** Reprinted from *Proc. Roy. Soc. Queensland.* 1949, v. 60, No. 7, 69–87, 1 pl. [Numerous refs.]

This Address concerns a remarkable medical man who went to Australia in 1888 and died there in 1947. His contribution to medicine was mainly concerned with infant welfare, which he organized on a wide basis: but he was also interested in bacteriology in its earlier days and contributed to the prevention of plague and to hookworm disease. Although entomology was his hobby and he was concerned primarily with its non-medical aspects, Turner made a tremendous contribution to systematic entomology, especially that of the Lepidoptera. He published 121 papers on entomology: but he also published no less than 115 on a variety of medical subjects, and all these papers are listed by the author. *H. J. O'D. Burke-Gaffney*

RHODESIA, SOUTHERN: DEPT. OF HEALTH. PAMPHLET NO. 10. **Sanitation in Rural Areas. An Outline of Principles and Problems.** 26 pp., numerous illustrations. [No date.] Salisbury: Public Relations Dept., Jameson Avenue.

See *Bulletin of Hygiene*, 1950, v. 25, 618.

RHODESIA, SOUTHERN : DIVISION OF HEALTH—NUTRITION COUNCIL. PAMPHLET No. 11. **Meals make Money. The Feeding of African Labourers.** 17 pp., 8 figs. [No date.] Salisbury : Public Relations Dept., Jameson Avenue.

See *Bulletin of Hygiene*, 1950, v. 25, 618.

RHODESIA, SOUTHERN : DIVISION OF HEALTH—NUTRITION COUNCIL. PAMPHLET No. 12. **The Wise and the Foolish Brothers. A Story for African Teachers and Demonstrators. Be Active, Healthy, Strong.** 20 pp., numerous illustrations. [No date.] Salisbury : Public Relations Dept., Jameson Avenue.

See *Bulletin of Hygiene*, 1950, v. 25, 618.

BOOK REVIEW

WARSHAW, Leon J. [M.D.]. **Malaria. The Biography of a Killer.** pp. viii+348. 1949. New York & Toronto : Rinehart & Co., Inc. [30*s*.]

This is the story of Malaria, the "World's Greatest Killer", designed to attract the interest of the general reader. The story is well told. A brief description of the nature of the disease and its wide geographical distribution is followed by references to the important part malaria has played in determining the fate of mankind. The history of malaria in America is related at some length : the author believes that there was no malaria in the western hemisphere prior to the coming of Europeans. Early speculations about the nature and causes of malaria are summarized. Laveran, Manson, Ross and Grassi has each a chapter devoted to himself.

Seven chapters are devoted to mosquito control. The work of Gorgas in Panama and elsewhere, and of Watson in Malaya, figure prominently. The history of the incursion of *Anopheles gambiae* from its African home into Brazil and its ultimate eradication there is well told. DDT receives rather less consideration than its importance merits ; no reference is made to the more spectacular results of residual spraying with DDT in the control of malaria.

Some 75 pages are devoted to the fascinating history of cinchona. The exciting adventures of Markham, Ledger and others in their attempts to smuggle cinchona seed and seedlings from South American countries to the Far East make good reading. A short account is given of the discovery and manufacture of the more important synthetic antimalarial drugs resulting from intensive war-time research.

The importance of malaria in war is illustrated by the story of Macedonian experience in World War I and of malaria in the Pacific in World War II. A chapter is devoted to malaria therapy. An enumeration of some of the unsolved problems of malaria brings the book to a close.

Readers specially interested in the subject will not find much that is new in these pages. A great deal of the information contained therein can be found in such standard works as SCOTT's History of Tropical Medicine. But the pages are enlivened with anecdotes and little known stories. The author has rendered a service in making available to the general reader a fascinating story in very readable form and in relatively small space. *Norman White*

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by the South Essex Recorders, Ltd., Ilford.

(591) Wt. P9/371 11/50 S.E.R. Ltd. **Gp. 432**